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Post-War Possibilities

Co-ordinating Supply and Demand

IF any apology is needed for our occasional ventures into the field of post-war economics it is that the British electrical industry will be one of the most important agents during the reconstruction period (and after) at home and overseas. Therefore it is incumbent upon us to draw attention from time to time to the trend of thought among those who are likely to influence world affairs after the war. It is equally our function to give expression to the views of the leaders of our industry in relation to those wider conceptions and, if possible co-ordinate them into a policy.

To attempt to lay down exact lines of procedure would be presumptuous. We can only point to the opportunities (or handicaps) which will confront the industry when peace is restored and set before readers the factors which must be taken into account in weighing up the possible situation.

Less Freedom

It seems to be inevitable that industry in general will not have the freedom to which it was accustomed before the war. While detailed control is regarded with pardonable apprehension by industrialists, some measure of overall control or co-ordination will have to be accepted if any of the large-scale plans to improve the country's economic standing are to be worked out.

Hitherto it has been widely believed that demand can be created and there is a great deal of justification for the belief. Unfortunately it is frequently found that demand is merely transferred from one commodity to another, with disastrous effects upon inelastic and heavily-involved industrial structures. Even when an industry is able to adapt itself to changing circumstances it is often the case that it forces itself into an already over-served market with adverse results not only to itself but to those already operating in that market.

Consumers and Workers

Sometimes, by association, an industry can protect itself from such consequences, but in doing so it may be charged with monopoly or restriction. It thus becomes fair game for politicians who, with a more or less genuine solicitude for the public, often fail to appreciate where the public's true interests lie. It may seem advantageous to the public, as consumers, to see an abundance of a commodity at low prices, but how are the public as workers affected?

Low prices have hitherto often been the result of over-production or, more truly, production beyond the buying capacity of customers. The result has been lack of profit or incentive to continue and people have been deprived of employment. This has still further curtailed purchasing power and industry has found itself in a depression.

Recovery has come from a restriction of production which has forced many manufacturers out of business, while those strong enough to hold on have been able

to raise their prices for a smaller volume of goods. Gradually this has restored equilibrium, but the position has remained precarious and the cycle has constantly recurred. The remedy seems to be the matching of supply and purchasing power and it has been abundantly proved that this cannot be achieved by allowing so-called "natural forces" to have unrestricted play. Some form of control must be instituted; but what that form should be is a matter of considerable debate. During the war a long stride has been taken in the direction of control, but with the object of minimising consumption, not expanding it, which must be the aim if the world is to be a better place to live in. It is only by pursuing this aim that there will be any prospect of that full employment upon which any scheme of social betterment seems to depend.

Fuel Rationing

SPEAKING at the annual conference of the South Wales Miners' Federation last week, the president (Mr. A. Horner) maintained that in spite of the success of the fuel economy campaign, compulsory rationing of all kinds of fuel and power was essential to the safety of the country. This follows upon the advice of the Ministry of Fuel to the public to store coal during the summer months in preparation for next winter. If people follow this advice they should have enough coal in hand to make winter rationing unnecessary—but they cannot store gas and electricity.

Motor Fuses

THERMAL overloads, which are now being extensively employed on starters for small motors driving machine tools, generally function very well, but some trouble has been experienced on account of the burning out of the heating coils of the thermal elements before the overloads have had time to act. The difficulty has been overcome in some cases by incorporating properly graded fuse protection in each starter.

Applied Physics

EACH year the Kelvin Lecture gives its reminder of the relationship between physics and electricity, in that so much of the rapid progress of electrical science is made possible by the researches of the physicist. How narrow the border line between the two may be was illustrated by Professor D. R. Hartree's description of the differential analyser used for the mechanical integration of electrical problems—a method that has already found its practical application, as he showed.

The Faraday Medal

No greater token in recognition of services in the advancement of electrical science can be bestowed by the Institution of Electrical Engineers than the Faraday Medal. It is peculiarly appropriate, having regard to the discovery of Faraday that is fundamental to the supply of electricity to the public, that the award should go this year to an engineer whose crowning achievement is to be seen in the grid with its great war record. Sir Archibald Page is the third engineer to receive the honour on account of activities in the same general field, his predecessors being Sir John Snell and Dr. Charles Merz.

Thermal-storage Heating

HOT-WATER engineers are familiar with the design and operation conditions of coke-fired space-heating installations, and they are unlikely to be converted at once to electrical methods, which call for a special technique in order to compete with coke. The onus, therefore, rests upon the electrical industry to take the initiative in developing and demonstrating the merits of a form of heat energy which, although relatively expensive on a crude BThU basis, is highly refined and flexible and also avoids waste of fuel after transportation. The Northmet Power Co., as indicated in this issue, affords a good example of enterprise in this connection.

Substitutes

IN general the word "substitute" seems to imply something which, although not quite so good as the original, can be used at a pinch—perhaps temporarily. This meaning still holds good for many things, especially in wartime, but there are other commodities or articles which are as good as, or even better than, those which they replace. Our American contemporary, the *Electrical World*, recently expressed the view that a more suitable name should be found for these. One of its readers suggests "replacors," but there is something a little too definite in this word. Surely "alternatives" would do.

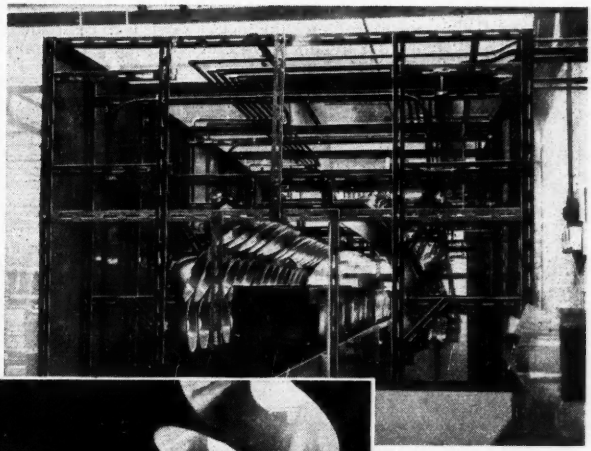
Factory Process Heating

Infra-red Radiation and Steam Raising Plant

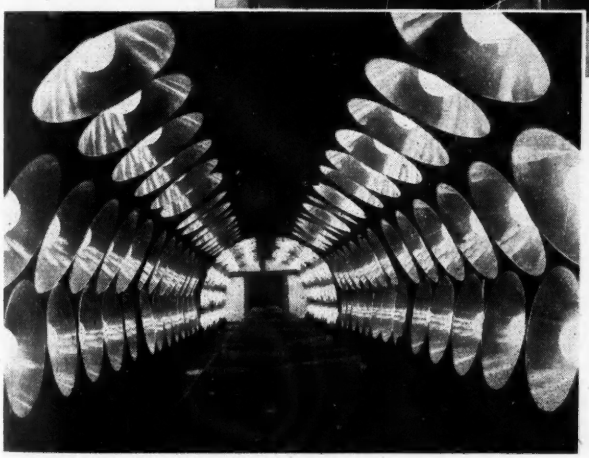
THERE are not many factories in this country, whose normal function is the production of electrical appliances, which can properly claim to be all-electric in respect of their process-heating methods. Fewer still have themselves designed as well as constructed the larger of the furnaces they employ, as is the case with Moffats, Ltd.

Speedy execution of Government contracts is being facilitated by the use of electrically generated heat, applied in six distinct ways, in the Blackburn factory of the company, which is further distinguished by the possession in regular non-experimental service of an infra-red radiation "tunnel" for drying paint. This installation is probably the first of its kind in England to be employed commercially for actual production work. It shortens the drying time to about six minutes instead of the usual eight to twelve hours duration for air-drying.

The "tunnel" is 25 ft. long; its loading is equivalent to 55 kW and can be adjusted by means of switching to suit the variable speed of the conveyor. The radiation comes from glass-bulb lamps with tungsten filaments of a special variety which operate at a rather lower temperature of incandescence than those employed for illumination. Each lamp rating is 250 W at 110 V, in order to permit of a larger filament area, the step-down from normal voltage being effected by connecting every pair of lamps in series. Each bulb is contained in its own spun-copper reflector, gold-plated internally, attached to slotted steel framework arranged in pantograph fashion for focusing purposes.



Adjustable steel framework supporting gold-plated reflector lamps



Thus the banks of lamps are formed into an almost circular "tunnel," the radial arrangement of which is reasonably adjustable to conform to the work being done. It is, for instance, in most cases necessary to direct infra-red radiation of greater inten-

Interior view of infra-red heating "tunnel" for drying paint, 55 kW loading

sity at the base of some objects in order to compensate for the heat lost by conduction from them to the conveyor. Also, it may be advisable to avoid the convergent intersection of rays from more than three reflectors, for example, if overheating at the corners of rectangular objects is to be prevented.

The installation has been carried out according to the recommendations of the British Thomson-Houston Co., Ltd., the through-put capacity approximating to 6,000 articles dried per 48-hour week. The several constructional assembly operations, painting by compressed-air spraying and radiant drying constitute a continuous process, performed in sequence on an electrically driven conveyor moving at a speed that is variable to suit the conditions imposed by the rate of production. A synthetic resinous paint is applied in spray booths forming an abutment to the heating " tunnel," so avoiding deposition of dust, which results in a better finish. The close proximity of the two operations is indicative of the coolness of the " tunnel " surround, so different from any other form of drying chamber that the lamp banks do not really need to be enclosed at all.

Drying is effected at about 385 deg. F., the entry zone being maintained at a pre-heating temperature above that of the " soaking " zone, while the exit conveyor passes directly to the loading bay, or stores, so saving the time and space otherwise required for cooling-off.

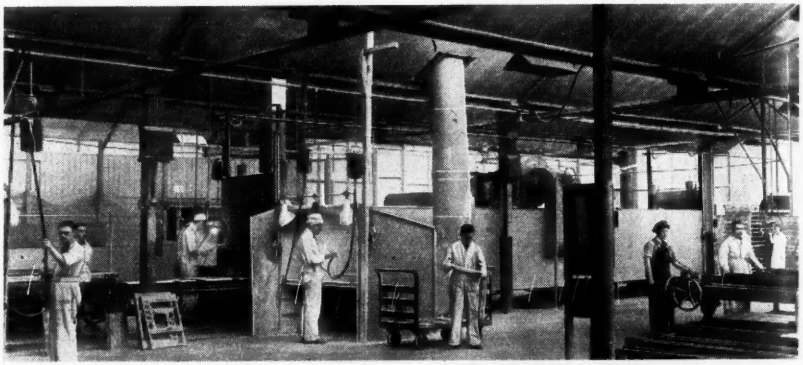
Economic Factors

The advantages of infra-red radiation for low-temperature industrial baking can be very marked. The *pro-rata* loading is often less than two-thirds (approximately 60 kW in every 100 kW) of that required for convection ovens. As the heat is instantly available, it can be switched off whenever work is not actually being done and there is no prior warming-up period during which energy has to be expended. Since the temperature of the " work " is raised so quickly, usually in from one to three minutes, the drying time is shortened remarkably. All of this means that less space is needed for the plant, the costs of drying and loading are lowered materially and these " tunnels " can be built into the production line, so that the rate at which work is turned out may be increased ten-fold.

The equipment is simple, relatively cheap and of comparatively light weight, while the lamps are flameproof. Indeed, infra-red radiation should be of decided commercial advantage to the electrical industry, since its comparative cost is much below that of competitive forms of heat.

Peculiar Properties

A second " tunnel " is in course of construction for installation at Messrs. Moffats' works, also intended for drying paint, which in this case is to be applied in two coats. The equipment will be arranged in two parts with an interval between to enable the first coat to be dried and cooled before this second coat is applied.



Vitreous-enamelled ware drying plant, 76 kW loading

Data will continue to be collected, particularly if oil-base paints are used, about the suitability of which in its present form there is some doubt. Experience gained so far has been of synthetic paints and enamels, but there does not appear to be any good reason why the infra-red ray method should not be used for any process in which the temperature does not have to exceed about 550 deg. F., providing the substances to be dried are capable of a fairly high degree of conduction to enable them to absorb heat.

Thus flax is claimed to have been experimentally dehydrated successfully when draped over a core or spread on a sheet of metal,

whereas cotton fabrics are difficult to treat because of their poor conduction factor, which involves a risk of surface burning before internal moisture is expelled. These effects illustrate a peculiar property of infra-red radiation which is largely responsible for its success. Paint may be said to be almost transparent to these rays, so that it does not commence to heat until the base material to which the paint is applied has absorbed the rays. Consequential internal energy dissipation causes the paint to dry outward from the inner surface, which is the ideal condition for minimisation of "skin" growth that may blemish the finish by swelling and cracking.

Box-type furnaces for firing enamelled ware ; 140 kW each

This core-heating effect is the reason why both inner and outer surfaces of metal boxes, for example, are dried simultaneously by outwardly applied rays. If the capillary action of the material is slow, theoretically at all events, infra-red radiation should dry out the heart more quickly than any other method would. But it must be pointed out that all heat-ray drying of whatever kind depends upon a source at high temperature, which is kept down by evaporation so long as it is occurring; directly the moisture has been ejected the substance being treated will become very hot, so suddenly as perhaps to ruin it, or some areas may be scorched while other portions remain under-dried because the water content of nearly every material is not evenly distributed.

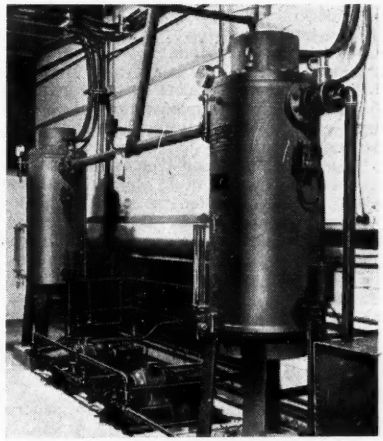
These observations may serve to discount popular theories concerning the action of radiant heat in drying processes, and to warn prospective users against fallacious results which may be obtained from random experiments with a few lamps. Nevertheless one may confidently emphasise the appropriateness of infra-red rays in almost all applications to materials that are suited to rapid heat transfer, which is the secret of the success of this method.

Acknowledgement is due to Mr. R. H. Harral, chief engineer of the Blackburn Corporation electricity undertaking, who kindly placed at the disposal of Moffats, Ltd., the services of his consumers' engineer, Mr. J. B. Ashworth, during the period of experiment and construction of the "tunnels."

Vitreous Enamel Drying

The second major application of electric heat is to the extraction of moisture from vitreous-enamelled ware before it is fired. The continuous dryer utilised for this purpose has been designed and built by the company's own engineers. It is 64 ft. long overall and operates on a forced heat-circulating system, the total loading being 75 kW. Variable speed control permits the conveyor to move forward at from 3 to 6 ft. per minute according to the type of ware passing through the dryer.

The whole of its interior surfaces are porcelain enamelled, a very desirable feature, so that they can be washed as a precaution against dust and dirt. Indeed, the main advantages of electric heating have been shown by experience to be the flexible manner in which the heat can be regulated and its cleanliness, which are essential to good quality in enamelling processes.



Electrode-type steam generators for space heating, each rated at 350 kW

The third heating method is the firing of enamelled ware in two box-type furnaces,

which have also been designed and made by the works staff. Their interior dimensions are 11 ft. 6 in. in length by 4 ft. 6 in. in both width and height. They are designed for a normal working temperature approximating to 1,600 deg. F., automatically controlled individually with the aid of pyrometers.

Coiled elements are situated on both sides as well as along the bottom, ensuring uniform constancy of heat, the total loading of each furnace being 140 kW. Their doors are operated electrically, remotely actuated, and a double shift fork has been installed for each furnace.

A corner of the sheet metal welding shop

Space Heating

Considerable heat is always lost in the hot air that unavoidably escapes from most large furnaces. But in Moffats' works a useful volume is collected for conveyance overhead through sheet-metal ducts to other parts of the factory for supplementing the main space-warming installation, which constitutes the fourth heating system.

Steam for the unit-type convectors is generated by two electrode boilers (Bastian & Allen, Ltd.) each rated at 350 kW. They operate at approximately 35 lb. per sq. in., which is the steam pressure required for the convectors. This plant is fully automatic, the system of control being a combination of room thermostats with steam pressure relays. The installation is arranged to function unattended, without manual regulation; it is brought into service each morning by time switch, according to the state of the weather.

Electricity is supplied to the steam generators on an off-peak tariff, the operative periods being adjusted by means of "Rythmatic" relays (Automatic Telephone & Electric Co., Ltd.) responsive to actuating impulses, of a higher frequency than 50 cycles, imposed on the AC feeder cables. The introduction of this remote switching feature has materially shortened the periods during which the supply of power is restricted, and also reduced the number of months during which limitation has to be exercised, since control of the load is directed from the switchboard in the municipal power station.

This installation leaves little doubt that the use of electrode boilers renders it possible accurately to control temperature for space heating throughout the single-storey factory, which was visited at a time of the year when snow and ice covered the frozen countryside.

Welding and soldering represent two more forms of electric heating, and electricity is extensively utilised for many other subsidiary purposes. The factory is fairly self-contained, including in addition to the enamelling plant a pattern shop, tool-making section, extensive foundry, pressed-steel shops, and stoving and assembly departments; it is intended that these up-to-date facilities shall be put to full use for the design and complete manufacture of electric cookers when the war is over.

Electricity in Gasworks

Changing to Public Supply

THE effect of increased labour costs on the economics of electric power generation in gasworks was referred to by Mr. W. Fletcher in his presidential address to the Manchester District Association of Gas Engineers.

On checking the cost of electricity generation it was found that the cost of the necessary attendance on the smaller units outweighed any saving in the actual production. Many gasworks, he said, had been developed to use DC at low voltage, which involved high cable costs as well as the use of expensive DC motors that, due to their construction, required considerably more maintenance than the equivalent induction type of machine. If the cost of generating electricity at the works was found to exceed the price at which it could be purchased and it was decided to take a public supply, it would be necessary to use mercury arc rectifiers to convert the incoming AC, or, alternatively, new motors and wiring suitable for AC must be installed. Although more expensive in first cost, the latter alternative would eliminate rectifier losses and save considerable capital cost in future electrical installations, but it would also involve the conversion of the existing generating plant in order to provide AC in the event of failure of the external supply.

In the undertaking with which he was connected it had been found economical to purchase electricity for three of the smaller works, and for the duration of the war the supply was being rectified for use with the existing motors, but it was proposed to install AC equipment after the war.

Improving Electricity Supply—IV

Development in Country Areas

MUCH attention has recently been focused by the Scott Committee on Land Utilisation in Rural Areas and by statements in Parliament and elsewhere on the subject of electricity supplies in rural areas. Little fresh has come to light regarding the difficulties, already only too well known, of providing this service, but new reasons are put forward for giving the matter a high priority in post-war affairs. New ways of dealing with the problem are also suggested, usually, we are afraid, by persons who are unacquainted with the peculiar problems of the industry.

Previous articles have discussed various views on the reorganisation of electricity supply. In this instalment attention is paid to the rural problem which has prompted many of the proposals which have been made. In particular, the question of subsidies is studied

The war has undoubtedly succeeded in bringing farming back into its own again, and it appears to be the Government's policy to endeavour to sustain its recovered prosperity. Then there is the repeatedly-expressed view that the large towns are already too big and that towns with a population between 50,000 and 100,000 should in future be aimed at. The development around the smaller towns and the creation of new towns thus proposed immediately involves the transference of both population and industry to country districts. These things, if they are to be brought about, make the provision of an adequate electricity service in rural areas important, both from the purely utilitarian point of view and also from that of rendering the countryside more attractive to persons who have hitherto been accustomed to the comforts of the towns.

Past Achievements

Before we go any further, we should like to make it clear that rural electrification is not, as some people would have us believe, something new. The industry already has a remarkable record of progress in this direction to its credit and, before the war put a stop to expansion, could probably claim a rapidity of development greater than at any time in any country. The technical features of development, too, are generally far ahead of other countries.

In 1939 supplies were available in practically all villages with populations of 500 and over and also in most small villages and hamlets with favourably distributed populations. Two-thirds of all premises in rural areas were connected. But for the war, supplies would probably by now be available to at least four-fifths of rural premises, covering practically all of the villages of over 250 inhabitants referred to in the Scott Report. For a fact we know that many of the larger rural undertakings, even before the war, had gone into the question of supplying all the hamlets of only 50 inhabitants.

The really difficult part of the problem of rural electrification is of course the supply of isolated premises which can rarely be economical. It must be remembered, however, that rural development is cumulative and that the greater the progress made in extending the network the easier the giving of further supplies becomes.

It does not seem probable that many objections will be raised to giving the facilities required in the Report, though, if uneconomic development is to be undertaken and if *every* house, farm, etc., in the country is to be supplied, some sort of financial assistance would be required, in the case of the smaller undertakings at any rate.

Provision of Subsidies

This matter of subsidising rural supplies is, of course, a bone of contention. Among the views we have heard expressed recently are: that the electricity supply industry is wealthy enough to take care of its own financial arrangements without any help from outside; that if the surplus profits from urban undertakings were employed for rural development for a period of, say five years, this would be sufficient to permit a reduction of 50 per cent. in rural charges and place rural supplies on a profit-earning footing; contributions now going to the relief of rates might be used for rural development; and that an electricity authority could cope with a rural area unaided, provided that it was of reasonable size compared with the urban area.

There would be considerable opposition to the suggestion regarding the employment of surplus profits of an undertaking on rural development outside its own area. It is, however, generally agreed that urban undertakings, in the development of their rural areas, should have regard to the total capital expenditure involved under both headings

and consider the development of their rural areas as part of their proper responsibility and business, and budget accordingly, that is to say, not attempt to separate the two classes of supply.

Though they would spread the cost more fairly all over the nation, subsidies do not in fact seem to meet with general approval. Possibly this is because of the not too favourable comparison between areas which have been subsidised in various ways (some of which are not even yet paying their way) and the rural development schemes undertaken without financial assistance and without any fuss. Perhaps, indeed, the undue prominence that has been given to the former schemes has tended to obscure the excellent work carried out unobtrusively by any number of undertakings as a part of their normal development.

Companies' Enterprise

Because of the way in which the industry has grown up the greater share of the rural development work hitherto has inevitably fallen on the shoulders of the company undertakings and of the smaller towns. Thanks particularly to the companies' enterprise and confidence in the future, supplies have been brought to districts which, being outside their supply areas, many municipal undertakings would not consider sufficiently remunerative to be worth bothering about. That these undertakings have been able to offer their consumers tariffs and conditions which compare favourably with those of the more fortunately situated urban authorities—and usually still make a profit—is a tribute to their organisation and management.

The rapid development has been fostered by the policy of education by advertisement and demonstration, but the progress has been so rapid that it is clear that much of the development has been due to recommendations by satisfied users. To-day, there is little need (and for that matter, of course, no opportunity) for canvassing to ascertain what support is likely to be given to a scheme, for if supplies can be brought near to any homes at the prices obtaining to-day, the country dwellers are eager to become customers.

It seems to be assumed by some, however, including the majority of the Scott Committee, that tariffs should be the same as in urban areas, and certainly proposals for reorganisation and redistribution of industry (and population) are not going to be helped by disparity in prices. But if prices are to be standardised why should not also the charges for other essential commodities? Perhaps it is a compliment to the paramount importance of electricity that we have heard no similar clamour for standardised charges for water, gas, transport, coal, etc., the prices of which vary greatly in different parts of the country.

Although some engineers claim that the time for making distinctions is past, rural supplies do cost much more to provide and the expenses of meter reading, servicing, etc., are considerably higher, so that it would seem reasonable for both installation charges and tariffs to be above those which are available in the towns. After all, the country dweller already enjoys a good few advantages in the way of pleasanter and healthier surroundings, etc., not available to the townsman. Can he expect the latter to contribute towards lowering his electricity charges? For that is what it amounts to, whether there are Government subsidies or not. We can find little to support the evidence referred to in the Scott Report that, by appropriate organisation of the distribution side of the supply industry, parity of cost between town and country could be achieved without increasing the burden on the towns. Professor Dennison in his minority report considered that this was a misrepresentation of the evidence.

So far as we can judge, the average rural dweller brought up with the kitchen range and paraffin and without power except for oil engines, is only too pleased to get supplies of electricity at all so that he is not likely to quibble about a few shillings a quarter one way or the other in view of the value of the services rendered. Of course, a consumer moving from a town to the country might look upon the matter from a rather different angle, and possibly some people might be deterred from going into the country if they did not get equivalent electrical service to the towns.

So long as the prices are reasonable and not beyond the means of wage earners (and agricultural wages have considerably improved), and if the undertakings are not making excessive profits after meeting all development charges, tariffs cannot be considered excessive and it is a far more healthy state of affairs to have the prices high enough to pay all expenses, than to have a subsidised undertaking. It is probably because the Electricity Commissioners have recognised that real progress depends on all work of this kind being financially sound that development has been so rapid.

Rural Industries

With regard to industrial supplies in rural areas, there might appear to be a strong case for standardising charges so that one part of the country would not be more favourably placed than another to encourage the establishment of factories; unless, that is, the charges were *lowered* in areas in which it was desired to establish new industries. The comparative insignificance of the power charges as compared with the rest of the operating charges—they represent only about 3 per cent. in the light industries which might be expected to be found in rural areas—does not give much weight to this contention,

however. The general rates and the availability of labour are much more important considerations.

Few will dispute the desirability of giving the farmer all the benefits which electricity can provide, but in view of the advantages he derives thereby and the rapidity with which his electrical apparatus pays for itself, there does not seem to be any reason why he should not make a reasonable contribution towards the cost of giving him a supply. Farming, is, however, a national necessity, and if it is not self-supporting, or until it is, the electrical industry is, to judge from existing schemes, willing to make its contribution towards rendering it a commercial proposition.

It is often suggested that help towards levelling up tariffs would be afforded by the standardisation of all grid charges; that further improvements in this direction would be derived from the amalgamation of undertakings so that the density of the population of each area (the ratio of population of town areas to that in the country may be in the order of 100 to 1) is improved; and that every rural area should have behind it the financial backing of an urban area.

Be that as it may, it is to be hoped that if any scheme of rationalisation or amalgamation is adopted it should at least ensure that future control of development would be based on the experience of those fully acquainted with the facts and not relying on theory.

The importance of rural electrification to the country as a whole is generally recognised. While on paper it would probably be possible to show that every rural extension scheme is carried out at a loss, it remains a fact that those undertakings which have handled the problem courageously have quickly succeeded in putting their schemes on a profitable basis and are most confident about the future. Whatever national policy is therefore adopted for dealing with the matter, the moral seems to be to "go all out" for business, so that as many people as possible may enjoy the advantages of electricity and so that the capital expenditure incurred in providing these facilities may bear fruit at the earliest possible moment.

Electricity for Farmers

Canadian Wartime Restrictions Relaxed

From an Ottawa Correspondent

IN North America as well as in England wartime restrictions have been placed on some supplies used for electrical purposes. An illustration of this has been limitations governing the use of materials required for electrical services in Ontario and Quebec. Owing to the necessity for increased food production the Munitions Department at Ottawa has now issued a relaxation order to enable farmers to raise their output of food by the introduction of electrical devices. The new conditions are as follows:—

(1) When it is shown to the satisfaction of the Hydro-Electric Power Commission (or power companies) that the supply of electric service to such consumers will result in substantially increasing the supply of foodstuffs for the Dominion.

(2) When not more than a total length of 600 ft. of circuit (whether primary or secondary or a combination thereof) is required to supply service from an existing distribution line to a consumer's service entrance or distribution centre—where such centre is not more than 100 ft. from any building to be served.

(3) When, if required, a single-phase transformer of not larger than 3 kVA rating may be erected as close to the load centre as practicable, together with the necessary associated materials.

(4) That a summary of conductors, transformers and meters used without permit during each calendar quarterly period be submitted not later than the 15th day of the month following. Construction on any project for a producing farm should not be started until the requisite material and equipment are assured.

Owing to the acute metal situation, suitable conductors from existing surplus, excess, dormant or second-hand stocks or from unused or duplicate plant should be utilised wherever possible. The Power Controller has signified his willingness to make power available. The Steel Controller has also permitted galvanised steel or iron wire to be used for such purposes.

White Mica Deposits in Canada

ACCORDING to *Electrical News & Engineering* (Toronto) deposits of high-grade white mica have been found in Northern Ontario. Supplies of this vital war mineral formerly came from India, Madagascar and Ceylon, and Mr. A. A. Moline, of the Canadian Westinghouse Co., recently told the Association of Municipal Electrical Utilities in Toronto that a shortage existed. The use of muscovite or clear phlogopite mica is prohibited in the United States except for war weapons, ships, etc., and is restricted even for such purposes.

The London J.E.A.

Recent Subjects of Discussion

SEVERAL interesting matters were to be considered by the London and Home Counties Joint Electricity Authority at yesterday's monthly meeting. Among them was the question of the exercise of purchase rights by local authorities in the J.E.A.'s District. This is thought to be of some importance in relation to the Authority's proposals for the reorganisation of electricity supply in the London and Home Counties area.

The Special Enactments (Extension of Time) Act, 1940, enables a local authority or authorised undertaker to apply for an extension of the time within which the rights of compulsory acquisition may be exercised, and this course has been followed in one or two cases. Should neither of the parties apply for an extension, Section 2 of the Electric Lighting Act, 1888, applies, and the acquisition rights could not then be exercised for a further ten years.

The attention of the Minister of Fuel and Power and the Electricity Commissioners is being drawn to this position and to the possibility that the Authority's, or other, proposals for reorganisation might thereby be prejudiced. It has been suggested that action might be taken to avoid this.

Arrangements with Central Board

In November last the General Purposes Committee reported the general agreement reached between the Central Electricity Board and the electricity supply associations regarding wartime arrangements at generating stations operated under the Board's directions. The proposal that legal effect should be given to these arrangements by means of a Statutory Rule and Order has been considered but the Law Officers of the Crown consider that this would be beyond the powers of the Minister of Fuel and Power.

In view of altered circumstances it is now proposed to proceed only with the clauses relating to the temporary suspension of Section 7 (4) (a) of the Electricity (Supply) Act, 1936, and to the financial protection of owners of stations which might be put wholly or partially out of action during the war. It is considered that it may be possible to deal with these provisions under a Statutory Rule and Order and, if the electricity supply associations concerned agree, it is proposed to ask the Minister of Fuel and Power to act accordingly.

Inquiries are being made as to whether the revised proposals are likely to prejudice in any way undertakers receiving supplies directly or indirectly from the Central Board on the terms of the published grid tariffs.

Restrictions on Development

The Electricity Commissioners in April last year informed electricity supply undertakings that new or additional supplies could be given only when they were required in connection with the war effort or for domestic or other purposes where withholding them would result in serious and exceptional hardship. The Commissioners have been asked whether new or additional supplies can be afforded, and the necessary materials provided, in cases where, by a change-over to public electricity supply, a substantial economy in fuel would be effected. Their reply was that in such cases the restrictions would apply.

It has been reported to the General Purposes Committee that the restrictions have been removed when an incoming tenant brings with him his own cooker to a house (wired and piped for both electricity and gas) where an existing electric or gas cooker is already installed, since by allowing the tenant to use his own cooker, the materials would be used to the best advantage and a cooker already installed would be available for essential use elsewhere.

Cable Contracts

Referring to the further restrictions placed on the types of cable for underground work, the Committee says that as the new types differ materially from those included in existing contracts (which expire on April 30th, 1943) with existing suppliers, amended prices have been obtained, representing an average reduction of about 15 per cent. As good stocks are held it is anticipated that purchases during the next twelve months will be very small. It was recommended that the existing contracts should be continued at the revised prices.

I.E.E. Benevolence

THE report of the committee of management of the Benevolent Fund of the Institution of Electrical Engineers, which is to be submitted at the annual general meeting on May 13th, shows that the assets amount to £31,971, which is invested, a transfer of £2,500 from income to capital account having been made during the year. Income from all sources was £6,006, £1,465 less than for the preceding year, the average contribution per member being 4s. 4d. Annual subscriptions numbered 4,009; there was one legacy, 58 subscriptions and donations of over £5 each and 3,613 donations of smaller sums. Deed of covenant subscriptions have increased to 390 and the fund has been able to recover more than £420 from income tax.

During the year there were 85 applications for assistance which was afforded in all cases, in this way the necessities of 64 dependants were provided for. Grants reached the record figure of £4,768, the increase of £336 being due almost entirely to distress caused by the war. A grant from the Lord Hirst Fund, formed seven months ago, has already been made to the family of a distinguished electrical scientist.

Institution's Annual Report

Copies of the annual report of the Council of the Institution of Electrical Engineers for the session 1942-43 and of the accounts for the year ended December 31st, 1942, to be presented at the annual general meeting on May 13th, at 5 30 p.m., can now be obtained by members of the Institution on application to the Secretary.

Transformer Loading

Exploitation of Thermal Limits as a War Measure

By C. H. Pike, Grad.I.E.E.

IN view of the necessity for minimising new construction during the war and the immediate post-war years, increasing attention is being given to the more effective utilisation of both new and existing electrical plant. In the *Electrical Review* recently* reference was made to a suggestion from the United States that transformers should be rated up to the limit of heating capacity, even though this might reduce their useful life. Doubt was expressed whether the increased loading capacity thus obtainable justified a shorter life-expectancy and greater liability to failure. More recently in another article† it was pointed out that, since in practice a transformer seldom operates at its B.S.S. rating, *i.e.*, on full load continuously and in the maximum ambient-air temperature of 40 deg. C., more than the specified output is usually obtainable.

The author discusses some of the practical aspects of loading transformers up to the limit of thermal capacities determined by reference to their B.S.S. ratings

The safe loading, on a thermal basis, of a transformer depends on there being an observable temperature which is a criterion of the internal - winding, or hottest - spot, temperature. The author of "Loading of Transformers" stresses the necessity for the fitting of some form of temperature or load indicator, calibrated in terms of hottest-spot temperature, if thermal loading is not to reach dangerous temperatures. With many existing units, however, only the hottest-oil temperature is observable and, in general, to equip them with indicators would necessitate certain modifications and tests which can be made only at the manufacturers' works. The question is then whether, without such indicators, transformers can be loaded on a thermal basis by reference to hottest-oil temperatures.

Hottest-Spot and Hottest-Oil Temperatures

With some units the relation of hottest-spot temperature to hottest-oil temperature is comparatively indefinite under steady load and very indefinite when a sudden overload is applied. In the latter case the winding temperature increases rapidly, whereas the oil, owing to its bulk, may take several hours to reach a steady temperature. Nevertheless, with many self-cooled units operating on a known load cycle the temperature relations are fairly definite and critical values of hottest-oil temperature can be stated by the manufacturer. These values are often considerably higher than those reached when units are operated by reference to ampere loadings; consequently increased loadings are often permissible.

Manufacturers' values will, in general, be somewhat conservative, and this will be a safeguard against dangerous winding temperatures under most load conditions. It seems probable, therefore, that, although maximum utilisation of thermal capacity can be obtained only when a definite indication of winding temperatures is available, a certain amount of reserve thermal capacity can often be utilised in the case of units which can be loaded only by reference to hottest - oil temperature. Obviously, the possible over-load capacity of a transformer must be considered in relation to all the factors involved. This involves no increase in transformer rating above that stated by the makers; it is simply a question of taking advantage of conditions more favourable than those assumed for units rated in accordance with B.S.S. 171–1936.

Maximum Permissible Values

In this Specification permissible temperature rises for units with different classes of cooling are stated. Maximum permissible temperatures are not given, but since the specified temperature rises are those above standard - reference ambient temperatures, maximum temperatures for the various classes of cooling can be formulated, as shown in the following table. The standard-reference ambient temperatures are for air a peak value of 40 deg. C. and an average value of 35 deg. C. over 24-hour periods, and for water 25 deg. C.

TEMPERATURE LIMITS (DEG. C.) FOR TRANSFORMERS WITH CLASS A INSULATION

Copper Temperature. Continuous (*a*)	Class of Cooling		Oil Temperature. Continuous
85	OW		75
95	OFW		75
95*	ON	OB	85*
100*	OFN	OFB	85*

(*a*) As measured by increase of resistance.
* Peak values 5 deg. C. higher are permissible providing the average temperature does not exceed the figure shown.

Under service conditions the ambient-air temperature will seldom approach and rarely

* "Transformer Design," by D. W. McJannet, August 14th, 1942.
† "Loading of Transformers," by E. T. Norris, *Electrical Review*, February 5, 1943.

be maintained at 35 deg. C., so that with normal rated output the temperature—as distinct from the temperature rise above existing ambient temperature—may be considerably below the maximum value permitted. Therefore, under favourable ambient conditions a transformer is capable of a greater output—either continuously or for a period—than that corresponding to the "continuous maximum rating" which is the basis of B.S.S. 171.

Again, even with standard ambient temperatures, a transformer can carry a sustained overload for a period, the duration of which is determined by the percentage overload and the value of the load (and therefore the temperature of the unit) before the application of the overload.

The B.S.S. gives data for the calculation of the permissible duration of overloads with different classes of cooling, etc. Although it makes no mention of maximum permissible temperatures in connection with overloads (since the sole limit to output is the maximum temperature that the insulation will withstand continuously without deteriorating at an excessive rate), transformers can in practice be operated by reference to some predetermined maximum value of observable temperature—in short, on the basis of thermal capacity.

Advantages of Thermal Loading

Thermal loading, by utilising transformer overload capacity, will often enable short peaks to be carried by fewer units than would otherwise be required. This has the incidental advantage of reducing switching operations and the associated transient over-voltages and heavy-current rushes which tend to weaken, both electrically and mechanically, the winding insulation. It is also conducive to longevity to avoid wide changes of temperature (which tend to cause relative movements of conductors and insulators and of the windings and core) such as those which follow the rapid loading of cold transformers.

Thermal loading may increase losses where the practice has been to operate a number of transformers in parallel at an output that yields the highest group efficiency, which is maintained with increase of demand by switching in further units even if the total loading is less than the rated output. On the other hand, at unattended substations, with low load factors and occasional peaks, thermal loading will permit units to be kept off load, thus minimising light-load losses and increasing the all-day efficiency of the group.

Thermal loading should not increase voltage-drop by more than 1 per cent. and, generally, voltage regulators have a sufficient range to cover the requirements. The high temperatures associated with thermal loading cause a more rapid deterioration of oil quality, but this may not be appreciable if more equable temperatures are obtained. In any case as fewer units will be in service the more frequent oil maintenance will not necessarily be uneconomic.

For the prevention of acidity, Class B oil is preferable to Class A. B.S.S. No. 148–1933 recommends the use of Class B only for transformers in which the maximum oil temperature does not exceed 75 deg. C. The use of Class B oil in units designed originally for filling with Class A oil may therefore result in a reduction in the maximum safe load, the output being restricted by the maximum oil temperature permitted, even though the winding temperature may be well below the limit. Class B oils can, however, be produced which are capable of withstanding temperatures up to 90 deg. C. without prohibitive deterioration.

Conservators and Breathers

In his contribution to the discussion on the I.E.E. paper by Mr. F. Meyer, "Fluid Filling-Media for Electrical Apparatus," *I.E.E. Journal*, 1940, Vol. 86, p. 313, Mr. D. V. Onslow stated that "No cases of trouble due to Class A oils have been brought to our [the E.R.A.] notice where conservator tanks or breathers have been used, and two large manufacturers of transformers of this type have stated that they have had no troubles with either Class A or Class B oils. Trouble has been experienced with some transformers without conservator tanks or breathers using Class A oil."

This and other evidence suggests that the fitting of conservators and/or breathers to most transformers is worth while; first, because of reduced oil maintenance and, secondly, because units can then be loaded to the limit of their thermal capacity without excessive deterioration of oil quality.

Prevention of acid and sludge formation is best effected by maintaining an oxygen-free atmosphere inside transformers by sweeping out the air above the oil with an inert gas and then hermetically sealing them with an expansion device or by maintaining a slow trickle of nitrogen gas through them. The adoption ultimately of these methods should prove economic, since they would enable a cheaper oil to be used and thermal loading to be general.

To sum up, it seems probable that increased outputs can be obtained from many existing transformers by loading them to the limits of observable hottest-spot or hottest-oil temperatures. For the self-cooled type increased outputs can be obtained by improved ventilation, but before fitting a fan and cowling to blow air into the radiators, the makers should be consulted, since an air-blast may alter the internal temperature distribution. In this case a previously stated

(*Concluded at foot of next page*)

Controlled Heating

A Contribution to Fuel Economy

IMPORTANT tests under normal working conditions are being carried out by the Northmet Power Co. on sixteen installations to ascertain the savings in heat energy that can be effected through the automatic control of electric space-heating machines of the hot-water-radiator type in association with thermal storage cylinders, which are "charged" during the night by heaters of the immersion and also of the electrode type.

Investigations which the Northmet Power Co. is carrying out illustrate the savings in heat energy which are possible with automatically controlled electric space heating as recently described by Mr. R. Grierson

We were recently afforded an opportunity of inspecting some of the installations and of scrutinising the results obtained, which bear out in a remarkable manner the claims for heat economy which were advanced on behalf of the system in Mr. R. Grierson's address as chairman of the I.E.E. Installations Section (*Electrical Review*, October 23rd, 1942) and in articles which he contributed to our issues of November 27th and March 19th.

The principle involved is that the heat energy required for maintaining the desired condition of thermal comfort indoors does not depend solely upon the temperature desired in a building, but upon the *difference* of temperature, *i.e.*, the thermal "voltage" or potential maintained between internal structures and the external ambient air. These inter-relations are ascertained by reference to the "degree-days" basis previously discussed (*loc. cit.*) and the flow-pipe temperatures are automatically adjusted in accordance with and in advance of requirements.

A target consumption for a standard season based on official records has been worked out for each installation. A thermograph fixed in a Stevenson screen at Northmet House provides data from which a correction factor for the weekly consumption and the seasonal consumption to date are sent each week to the company's local offices. The actual consumptions in kWh, we observed, are remarkably close to the target figures.

Four of the installations are fitted with the series-parallel method of flow-pipe control developed by Mr. Grierson to enable automatic control to be applied to existing apparatus. This method incorporates a group of five thermostats (which open on rise of temperature) mounted on an external north wall and cross-connected to a group of five thermostats associated with the main flow-pipe in such a manner that they control, by means of mixing valves, the flow of hot water from the storage cylinder to the radiators. The valves are solenoid-operated by DC derived from a Westinghouse rectifier.

Operation of Thermostats

The thermostats are adjusted to hold the pipe temperatures at five equally spaced values between 180 and 100 deg. F., which give mean radiator temperatures 20 deg. lower in each case and correspond to five outdoor temperatures of 34 up to 58 deg. with 6-deg. intervals. A sixth outdoor thermostat energises a second solenoid circuit to pass additional hot water from the storage cylinder when the external temperature falls below 45 deg. There are also a couple of "zone stats" in series with the outdoor units, one of which limits the day temperatures of the building interior to a maximum of 65 deg. and the other limits the night and week-end temperature to a minimum of 55 deg., as it has been found economical not to let it fall below this value. Change-over for the two periods is effected by means of a Venner time switch fitted with synchronous drive incorporating a thirty-six hour spring storage.

The method of operation is shown in the simplified diagram in fig. 1. On the outdoor temperature falling to 58 deg. F., thermostat

Transformer Loading

(*Continued from previous page*)

maximum safe value of hottest-oil temperature may be too high owing to increased temperature gradient between the hottest-oil and the hottest-spot temperatures under the new conditions.

In order to utilise fully the thermal capacity of new units, with a minimum of oil maintenance, they should be fitted with winding-temperature or safe-load indicators and be of the conservator or hermetically sealed types.

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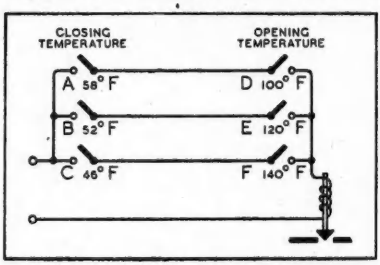

Fig. 1.—Thermostat/flow-pipe control system

E then controls the flow at 120 deg. D opens when the flow-pipe temperature exceeds 100 deg. Similarly, when the external conditions are 46 deg. F., C closes, transferring the control to F to hold the flow-pipe temperature at 140 deg. E opens and takes no further part in the operation. The two remaining are continuations of the foregoing. The arrangement shown is essentially an "on-off" or "hit-and-miss" form of control and was adopted on account of the existence of a number of triple-port solenoid mixing valves.

A preferable scheme would have included the use of a three-way valve, which might have as many as forty different positions between the closed and open settings, so that it could select the position which would pass water of the right temperature and remain there for 15 or 20 min., moving slightly afterwards to check any tendency for the temperature to rise or fall. The circulation system of mixed hot and cold water is indicated in fig. 2.

At two of the local depots Drayton control is employed. This consists of two temperature-sensitive bulbs, one fixed on a north wall and the second in a flow pipe, which are connected by capillary tubing to a single Bourdon pressure tube. A mercury switch attached to the Bourdon tube controls a three-way motorised mixing valve.

A further installation is governed on the Honeywell-Brown system, in which the adjustable arms of the several resistances and potentiometers (thermostats) of what amounts to a Post Office bridge are operated mechanically by bellows which are either temperature sensitive or are connected to temperature-sensitive bulbs. When the required conditions are satisfied, the relay floats and the three-way valve remains stationary. A rise or fall in the water or the external or internal temperature upsets the balance in the bridge causing the relay to operate the three-way mixing valve, thereby checking or accelerating the flow of hot water from the storage cylinder, as may be required.

The need to apply scientific methods to the control of electric heating is evident from a cost comparison (on a purely thermal basis) with the crude fuel with which it has to com-

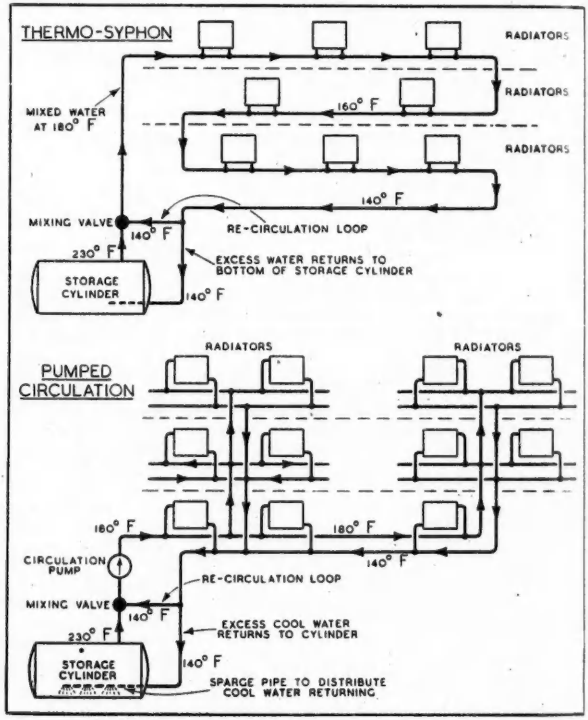

Fig. 2.—Diagram of circulation system

pete. A ton of coke having a calorific value of 12,000 BThU per lb. represents 27 million BThU, the heat equivalent of some 8,000 kWh. Assuming a pre-war value of £2 per ton, this corresponds to 0·06d. per kWh delivered into the furnace, exclusive of labour, maintenance and capital charges. A large proportion of these BThU is not effectively utilised, whereas with electrical systems automatic control of flow-pipe temperature concentrates the decisive (thermal) force at the decisive point (the occupied sections of a building) at the decisive time (period of occupation).

Demonstration of Flexibility

The flexibility of the electrical system is illustrated by the heating of one of the company's repair workshops—a structure that permits of little thermal storage in the walls. In cold weather the time switch operates at 6 a.m.; within 15 sec. the fan-heater units and the circulating pump are up to speed and within 5 min. water at 180 deg. F. is passing through the heaters, so that the factory floor is swept with air at from 100 to 110 deg. By 8 a.m. the whole premises is thermally comfortable. In mild weather 30 to 45 min. suffices for the cycle.

With regard to the influence of relative humidity, it appears that a variation of 50 per cent. in an occupied room has, according to Dr. T. Bedford of the School of Hygiene, the same effect on thermal comfort as a change of temperature by 2·1 deg. F. as shown on a dry-bulb thermometer at 60 deg. F. At 70 deg. with an air motion of 16 ft. per min. the equivalent temperature change would be 3 deg.

As an illustration of the contrast with an extreme, but by no means uncommon, existing practice, one can take the old type of church installation with, perhaps, a 4-in. cast-iron pipework system (containing a large volume of cold water) and gravity or thermo-siphon circulation of hot water supplied by a boiler containing, say, 1½ cwt. of fuel. This entailed the starting of the boiler on the Saturday afternoon or, in cold weather, the Friday evening. When sufficient data becomes available it should be possible to enter into contracts with consumers to cover their heating requirements for periods up to several years.

Our thanks are due to Capt. J. M. Donaldson, general manager of the Northmet Power Co., for permission to inspect the heating installations referred to in this article.

A New Drumm Battery

From Our Dublin Correspondent

A GREAT deal of secrecy has surrounded the Drumm battery, one of the characteristics of which has been stated to be its ability to take rapid charges at fairly frequent intervals. Trains propelled by means of these batteries have been operating between Dublin and Bray (Co. Wicklow) for a number of years. It is now announced that a new model of the battery, of all-metal construction for railway use, has been produced. The inventor, Dr. Drumm, states that it is capable of modification for road traction by the reduction of its weight by as much as 40 per cent. and its cost by 30 per cent. The main new feature of the improved battery is said to be the elimination of self-discharging or wastage.

The improvements made have been checked by the Edison Laboratories, U.S.A., where, according to the claims now made, " the battery has a future for such post-war traction methods as require electricity." The original electro-chemical construction is retained.

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Dr. Drumm, alluding to the former lack of faith in his battery, on the part of the Irish railways, recently told the *Irish Times* that a study of operating results made by Merz & McLellan showed the following comparisons between steam and battery operation based on the present four Drumm trains:—Cost per train mile:—Steam, 18·28d.; Drumm, 7·66d. Maintenance:—Steam, 7·41d.; Drumm, 3·43d. The amount saved on the four trains during twenty years' running is put at £1,670, allowing for all capital charges, maintenance, running costs and the provision of a sinking fund. In the next twenty years the saving would amount to £9,000.

Political Aspect

The Drumm battery was recently mentioned in Dail Eireann. The Drumm scheme, having been financed by the Government, has come within the political orbit, and there has been controversy that has not always remained within the strictly technical sphere. Mr. E. P. MacAllister, A.M.I.E.E., in an interview with a journalist, says " the result was that a scientist was asked to work to a time limit, and the four trains were built and put into commission before the inventor was really ready. He is, however, ready now. I believe a combination of third-rail electrification on main lines, and battery trains, would be the ideal solution to our rail problems and difficulties."

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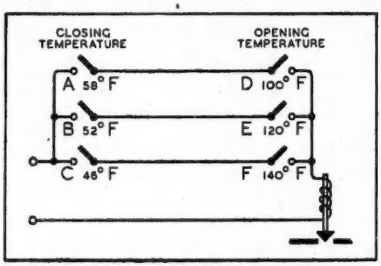

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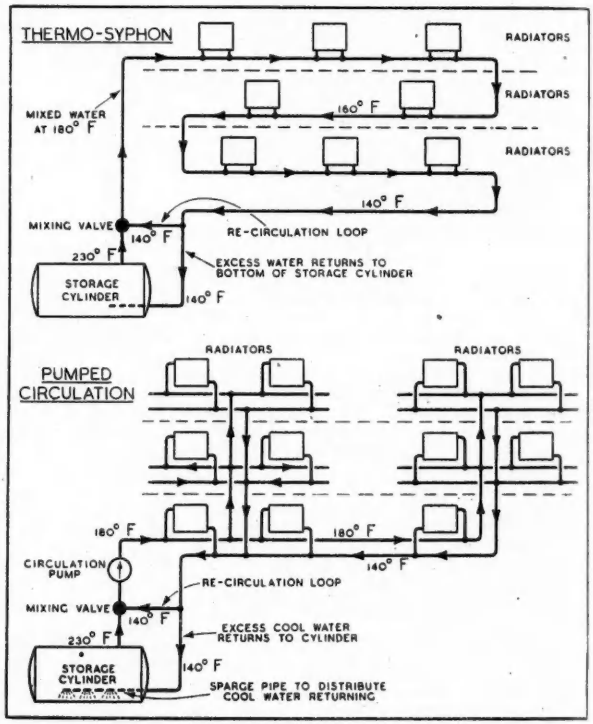

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Mechanical Integration

The Thirty-fourth Kelvin Lecture

AT the Institution of Electrical Engineers in London on Thursday last week Professor D. R. Hartree delivered the thirty-fourth Kelvin Lecture.

The subject, mechanical integration, seemed to the lecturer to be very appropriate to the occasion, since the differential analyser of Dr. Vannevar Bush can be regarded as the practical realisation of a conception originally due to Lord Kelvin, who made other contributions to the subject, particularly by the development of the first mechanical harmonic analyser. These mechanisms are tools for carrying out certain particular kinds of calculations, and the lecturer commenced by outlining the nature of problems with which they deal, being mostly concerned with continuous integration.

The first class of instrument referred to is the Abdank-Abakanowicz knife-edged wheel which bites into the surface over which it runs, so being constrained to move in its own plane. This method of first-order mechanical integration has been extended by Myers to second-order equations by the use of two wheels so connected by linkage that the slope of the second is proportional to the displacement of the first. The slope of the first wheel is made the sum of multiples of the displacements of the two wheels and of a pointer that is made to follow a curve. This instrument was developed expressly for application to electrical problems.

James Thomson's Device

Another class of mechanism consists of some form of continuously variable gear between the rotations of a driving and a driven shaft. A type devised by James Thomson (Kelvin's brother) consists of an inclined disc, a horizontal cylinder not in contact with it and a sphere in contact with both.

The differential analyser itself has been fully described elsewhere. The machine with which the lecturer is most closely associated is the one at the University of Manchester. The Metropolitan-Vickers Electrical Co., Ltd., was concerned in its construction.

The conception of interconnecting a set of integrating mechanisms so as to evaluate solutions of differential equations is due originally to Kelvin, who stated it clearly in considerable detail in two papers of 1876, from which the lecturer fittingly quoted to emphasise the original inspiration.

After describing the separate units which build up the differential analyser developed by Dr. Bush's team at Massachusetts Institute of Technology, U.S.A., the lecturer pointed out that this accurate form of instrument is large and costly. This machine incorporates parts that are made up of automatic telephone equipment; this section alone cost £700. The installation requires several kilowatts of power to operate it. Various smaller and rougher versions have been constructed, but the way in which they are set up and used was not pursued, beyond emphasis upon a few essential aspects.

Electrical Applications

The lecturer was rather more concerned with the application of this kind of instrument to the solution of electrical calculating problems, particularly in relation to circuits containing elements with non-linear characteristics, such as valves, iron-cored transformers and reactors, resistive elements of spark-quenching materials like thyrite and metrosil. The main application is to equations for which there is no formal solution.

The differential analyser is designed for the solution of ordinary differential equations: it cannot deal with partial equations directly. The latter have to be replaced by approximately equivalent ordinary differential equations before the machine can "get at them." There are two methods by which such replacement can be done. One of them has been described by Copple and others.* The other more recently developed method with which the lecturer is concerned is to be the subject of another paper that is now in preparation.

Both methods are approximate, but in both it is possible to estimate the error introduced by the use of a finite difference in place of a derivative and to correct approximately for such errors, sufficiently accurately for practical values.

* I.E.E. *Journal*, July, 1939, Vol. 85, No. 511, p. 56.

Trolley-Buses in Spain

ACCORDING to *Metalurgia y Electricidad*, the Ministry of Public Works, in conjunction with the State Directing Council of Road Transport and the General Direction of Railways, Tramways and Road Transport Vehicles, has recently drawn up a series of rules and regulations which have to be followed by all applicants for the establishment of trolley-bus services. The same journal reports that the Compania de Tranvias has built and placed in service the first of a fleet of thirty trolley-buses in Barcelona. Seating accommodation is provided for 29 passengers, with room for 34 standing.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

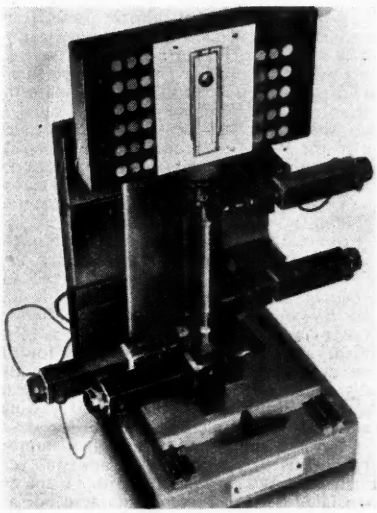
Electrical Limit Gauge

AN electrical visual indicator for checking mass-produced component parts to predetermined limits speeds up inspection and sorting into three categories.

The head of the device is provided with a micrometer screw to permit limits to be independently set. When the touch-point makes mechanical contact with the object being checked a light glows in one of three circular windows, coloured amber (plus) above and red (minus) below, the green (correct) indication appearing at the central aperture.

There are numerous different uses for and adaptations of this gauge, which may be fitted with a remote indicating panel so that when checking in awkward positions the operator is enabled to view the result at normal eye level. Also, multi-checking fixtures are available for simultaneously ascertaining eleven different dimensions of the one component part being inspected. The illustration depicts five in use with an outline drawing on the panel above linked up with five sets of indicating lamps, showing the operator at a glance which dimensions are outside the required limits.

A special adaptation has been made to sort cylindrical, or spherical, components into three sizes. The current which normally flows to the indicating lamps is used instead to energise small electrical relays which control the operation of chutes along which the sorted objects pass. Master cams switch the current to the measuring head and also regulate the gravity hopper feeding arrangement.

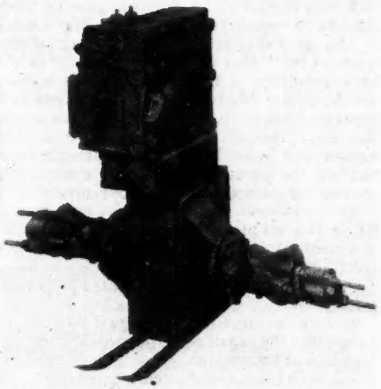


Sigma signal indicator for limit gauging and sorting

These devices are manufactured by the Sigma Instrument Co., Ltd., Letchworth, Herts, the sole agent being E. H. JONES (MACHINE TOOLS), LTD., Edgware Road, The Hyde, Hendon, London, N.W.9.

Colliery Lighting Transformer

For underground lighting in collieries, particularly in engine houses, haulage flats, turn outs, conveyor loading stations and similar situations, a step-down transformer of completely new design is announced by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17.



"Metrovick" flameproof transformer for underground lighting in collieries

This standard ML3-type lighting transformer is flameproof and of 0·3 kVA capacity, furnishing AC at 110 V wherever a cable run, power transformer main switch, or gate-end box is available as the input source. Two renewable fuses are provided on the primary side and a double-pole switch-fuse on the secondary side, forming an integral part of the unit, which is covered by a Buxton certificate.

The skids which are shown in the illustration are secured to bosses in the base of the tank by four bolts; they are supplied only when specially required.

Non-Statutory Suppliers

WE have received from the Association of Non-Statutory Electricity Suppliers & Distributors ("Non-Stats"), 11, Dence Park, Herne Bay, Kent, a copy of its 25th report. This contains a list, classified by counties, of non-statutory undertakings in England, Wales and Scotland.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

I.E.E. Graduates

WE were glad to note that in your issue of April 2nd an opportunity was taken of emphasising the subject of the article in the March *I.E.E. Journal* concerning Graduate Members.

In view of the publicity given to the need for suitably trained technical men, one would think that this " engineers' war " would make such demands on Graduates as to ensure that they were employed to the maximum of their technical capacity. A suitable guiding principle as to whether a Graduate is doing work of the greatest national importance would seem to be " does his job enable him to use his capabilities to the full, and so fit himself for Associate Membership ? " If there is a negative answer to this question, then surely the post should be occupied by a less experienced individual such as a trainee from one of the intensive electrical engineering courses organised by the Government.

At a recent meeting of a number of Graduates employed by a Government Department in Bath, the following facts were ascertained :—

1.—Many of these Graduates employed on the placing and progressing of orders have not at any time, in the past three years, required the use of even the most elementary technical knowledge.

2.—Other Graduates employed on routine drawing office duties have also required little or no technical knowledge.

3.—Men with no electrical experience or qualifications have been appointed to identical positions with respect to rank, salary and duties.

Although the attention of the authorities has been repeatedly drawn to the issues outlined above, no action has been taken by them to improve or attempt to improve the situation. Resignations, even when proffered for the purpose of taking technical commissions in the armed forces, have not been accepted on the grounds that the present employment is of greater national importance.

Bath. SEVEN I.E.E. GRADUATES.

A Mobile Accounts Department

REFERRING to the *Electrical Review* of April 23rd, I notice that in its Purley area the County of London Electric Supply Co. has provided an easy method of paying electricity accounts, by means of a caravan. Can you tell me why the Scottish system of paying corporation accounts has not been generally adopted in England ?

While living in Edinburgh I found that any corporation account could be paid in cash into any bank, a full receipt was given by the branch and no trouble was experienced in any way. I think if this system was adopted in England, it would encourage the prompt paying of all corporation accounts.

Before going to Scotland I lived in a city where to pay corporation accounts took fully two hours and necessitated going to the respective offices which were spread all over the city.

Harrogate. HAROLD T. WARRAND.

Dry Battery Construction

NO doubt owing to Government demands, supplies of dry batteries to the general public have been held up, but the position would not have been so bad if the public had done its duty earlier. Batteries recently on sale have to a certain degree been below pre-war standard. The public has bought them and, when they have only lasted a short time, has accepted the retailers' blame for early failure to war conditions. Nevertheless, if anyone purchasing a " dud " battery would insist on a free replacement, he would get it.

Defective batteries returned to the manufacturers by retailers are replaced free. These free replacements are not subject to purchase tax, and the manufacturers have to make a return of batteries supplied tax-free, thus providing the Government Department concerned with an opportunity to obtain the percentage of bad material turned out. If this were done and the figures were passed on to the Board of Trade, then the Department responsible for the issue of raw material could require an improvement in a manufacturer's standard of production, thus avoiding waste of valuable material.

From all the dry cells thrown into the dustbin when exhausted, a large proportion of material could be salvaged. The zinc containers are not reduced to anything like half their original weight by chemical action, as many cells fail owing to the mixture being too dry. On the other hand, many torches and cycle lamps have been ruined by dry cells which weep a slimy mixture that eats away the brass switch blades and castings and ruins the complete fitting.

I have recently sawed through a number of dry cells of various makes and was very much surprised at what I learnt. I am not associated with battery manufacture nor am I a battery or chemical expert, but I do know that the best batteries used to be made

up in this way: In the centre of the cell was a carbon rod with its top capped with metal for making soldered connections. This carbon rod was then surrounded with a mixture of fine carbon and manganese and the loose material was bound up around the carbon rod in a linen or fabric sack the combination being known as a "dolly." The "dolly" was then fitted with insulating strips to centre it when placed in the zinc container and the sal-ammoniac and other active material filled the annular space between the sack and inside of the container, the cell then being closed with sealing compound and the connections fitted.

I have experienced less than 2 per cent. failures with batteries constructed in this way. Of other cells examined, I found one in which a moist mixture of fine carbon and manganese had been compressed around the carbon inside the zinc container. The result was that after a time the compressed material fell apart, and some of it "packed" down and came into contact with the container, resulting in an internal short-circuit. Another make of cell opened up was similar in make-up, but to get over a possible short-circuit the "dolly" was enclosed in two turns of absorbent paper.

Government Departments have put out a specification for dry cells. If raw material, power and labour is to be used to the best advantage in the war effort then the batteries for the public should be as good as those supplied to the Services.

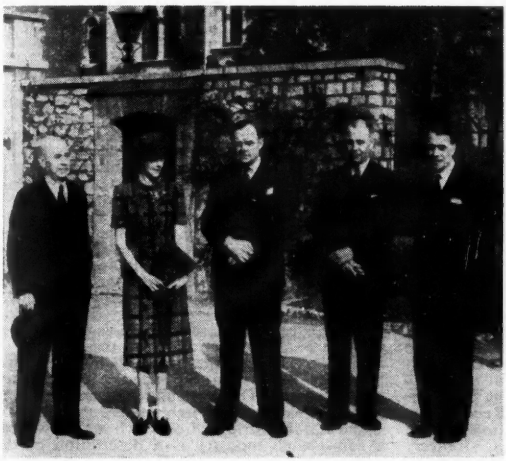
Yeovil. C. J. BENNETT, A.M.I.E.E.

PERSONAL and SOCIAL

News of Men and Women of the Industry

A SPECIAL meeting of the Luton Electricity Committee is to be held on May 10th to consider applications for the position of borough electrical engineer rendered vacant by the recent death of Mr. Rennie Dean.

Major G. Lloyd George, Minister of Fuel and Power, recently visited the western part of the country and during his tour called at the Area headquarters of the Central Electricity Board, where the accompanying photograph was taken.



Left to right: Mr. J. T. H. Legge (C.E.B.), Mrs. Lloyd George, Major Lloyd George, Major E. Cadbury (Regional Fuel and Power Controller) and Sir Frank Tribe (Ministry of Fuel and Power)

Sir **Noel Ashbridge,** Controller of Engineering, B.B.C., was elected president of the Radio Industries Club in succession to Col. V. Z. de Ferranti, at the twelfth annual general meeting on April 20th. The following new members were elected to the committee:—Messrs. Guy R. Fountain (Tannoy Products), A. J. P. Hytch (B.B.C.) and J. H. Williams (A. C. Cossor, Ltd.). Messrs. A. G. Beaver (Sun Electrical Co., Ltd.) and W. E. Miller (*Wireless and Electrical Trader*) were re-elected. Mr. H. de A. Donisthorpe (G.E.C.), the chairman, presented the annual report which showed a rise of 33 per cent. in the membership (from 245 to 326).

Mr. W. W. Grimes, A.M.I.E.E., A.M.I.Mech.E., has been appointed engineer and manager of the Chesterfield Corporation electricity undertaking in succession to Mr. D. H. Davies, whose retirement was recently mentioned in these columns.

Mr. Grimes joined the Chesterfield undertaking in June, 1941, as assistant mains superintendent, later becoming senior technical assistant. He had previously held various appointments in the generating station and mains department of the West Ham electricity undertaking. Mr. Grimes, who is thirty-six years of age, served his apprenticeship with Hunter & English, Ltd., London, and received his technical training at the Leyton Technical College and the Northampton Polytechnic, London.

Mr. T. E. Houghton, power department manager and group electrical engineer of the general chemical group of Imperial Chemical Industries, Ltd., has been elected chairman of the Mersey and North Wales (Liverpool) Centre of the I.E.E. The vice-chairmen are **Messrs. J. Cormack** and **J. C. Knowles.**

Mr. J. W. Dorrinton has been nominated as

chairman of the Bristol Students' Section of the I.E.E. for the session 1943-44.

Mr. Nevin E. Funk, vice-president in charge of engineering and station operation, Philadelphia Electric Co., has been nominated as next president of the American Institute of Electrical Engineers.

Obituary

Mr. H. Huartson.—The death has been announced of Mr. Harold Huartson, chief electrical engineer of the Birmingham Gas Department. Mr. Huartson, who was born at Derby in 1891, entered the service of Birmingham Corporation in 1914, in the Gas Department's electrical power house. In 1924 he was appointed assistant engineer and in May, 1940, on the retirement of Mr. H. R. Lamb, he became chief electrical engineer. Mr. Huartson, who was an associate member of the Institution of Electrical Engineers, leaves a widow and two children.

Mr. Hans Renold.—The death occurred on May 2nd at Grange-over-Sands of Mr. Hans Renold, whose name is associated with a widely-used method of chain transmission and who was the founder and director of the Renold & Coventry Chain Co., Ltd. Mr. Renold was educated at the Technical High School, Zurich. He was a pioneer of mass production to precision limits. Last year, to celebrate his ninetieth birthday, the employees of his company established a fund the income from which is to be used for providing prizes for mechanical engineering students.

Mr. J. M. Coon.—The death which occurred recently at St. Austell of Mr. Joseph May Coon at the age of eighty-seven severs a link with the early days of electric lighting and telephony. Mr. Coon was the first to introduce electric light to St. Austell and Mevagissey, and he was also a pioneer in the use of the telephone. Telephone instruments invented by Professor Alexander Graham Bell in America were brought to Plymouth, and were given to Mr. Martin, the then postmaster there, who in turn lent them to Mr. Blewett, of Charlestown, St. Austell. With the help of Mr. Coon they were installed and telephone communication was established between Charlestown and St. Austell.

Mr. William Marshall, senior partner of William Marshall & Sons, electrical and radio engineers, of Stirling died recently at the age of eighty-four years.

Will.—The late **Mr. W. O. Smith,** M.I.E.E., of Elliott Bros. (London), Ltd., and a vice-president of the British Electrical & Allied Manufacturers' Association, left estate valued at £260,385 (£254,216 net personalty).

NEW BOOKS

The J. & P. Switchgear Book, Vol. 2. By R. T. Lythall. Pp. 227; figs. 196. Johnson & Phillips, Ltd., Charlton, S.E.7. Price 15s.

The issue of a further volume of this standard outline of modern switchgear practice will be welcomed by those who specify, purchase or use switchgear, for whom it is intended. Like its predecessor, the present volume covers what may be regarded as sound common practice and the information it gives is drawn from many sources and is not restricted to the experience of any one manufacturer. It is in large part supplementary to the first volume published in 1938, bringing it up to date in the many instances where recent developments and operating experience have warranted additional matter. Thus, considerable attention is paid to progress in low-voltage air-break switchgear, low-oil-content breakers, high-rupturing-capacity fuses with tripping devices, filled-type switchgear and the use of arc-suppression coils.

The further practical notes on maintenance and the miscellaneous technical data and diagrams should be particularly helpful to works electrical engineers, as should also be the commentary on relevant Home Office Regulations, more especially since the publication of the almost indispensable Form 928 has, strangely and unfortunately, been suspended temporarily. Instrument transformers are closely associated with switchgear and receive due treatment. Automatic voltage regulators provide the subject for a chapter of thirteen pages, on the ground that they are usually included in the switchgear work. Much time and labour in calculating the reactance of bare copper conductors of various sections and spacings can be saved through the use of the table and formula devised by Mr. Lythall, which is reproduced from the *Electrical Review*. A commendable feature is the inclusion at the end of each chapter of a full bibliography of the aspects with which it deals.—C.O.B.

Modern Industrial Lighting. By G. Bernard Hughes. Pp. 128; figs. 63. Hutchinson & Co. (Publishers), Ltd., 47, Prince's Gate, London, S.W.7. Price 15s.

Industrial lighting is to-day a subject of national importance, since production has to be maintained in spite of a reduction in the skilled labour forces available. Improvements in lighting methods have been so rapid that it is useful to have information assembled so concisely. The author, by a nice blending of fact and reason, shows the value of good lighting as a production tool, and deals with every aspect of the subject from the viewpoint of the lighting technician, the factory executive, and the operator.

The chapter on glare emphasises the fact that the eye is affected as much by the quantity of light as by the brightness of the light source, and for that reason an unshaded window often causes glare. Of particular usefulness is the section dealing with lighting requirements of some 120 industries, 24 of which are illustrated. Against each industry is a description of the visual task and the recommended illumination, although these do not in all cases agree with the values shown in an appendix.

Light sources are treated quite fully, one chapter being devoted to fluorescent tubular lamps, the physics of which is dealt with in interesting and popular language. As a book of reference, many useful tables and definitions are contained in the appendices. The section dealing with the maintenance of fluorescent tubes fills a long-felt want.—E.B.S.

COMMERCE and INDUSTRY

New Employment Order.

Part-Time Work

AT the same time as it announces measures for the direction of men and women into part-time work the Ministry of Labour and National Service has made the Control of Employment (Directed Persons) Order, 1943, to ensure that proper conditions are observed by employers of part-time labour. This is roughly equivalent to the Essential Work Orders which do not apply in the case of part-time workers.

Direction into part-time work will be for a definite period, normally six months, and the maximum hours per week will be thirty. The arrangements will mostly affect women with domestic responsibilities. They will be directed only with the advice of women's advisory panels and only to work within easy reach of their homes. The principal intention is that these women shall undertake work other than that of primary national importance in order to release others for more vital work.

I.M.E.A. Meetings

As we have already announced, the annual general meeting of the Incorporated Municipal Electrical Association is to be held on June 17th. It will take place at the Connaught Rooms, London, W.C.2, and will be preceded by an extraordinary general meeting at 10 a.m.

Mass X-Ray Examinations

Last week the Minister of Health (Mr. E. Brown) announced the Ministry's intention to intensify the campaign against tuberculosis. In particular it was proposed to institute a system by which large numbers of people would be examined by means of X-rays to enable the existence of the disease to be discovered at an early stage and eradicated by prompt treatment.

For this purpose miniature X-ray outfits capable of producing 500 films a day in the hands of skilled assistants working under the direction of a medical man would be employed. These equipments used ordinary cinema "stock" and produced negatives about 1 in. square from which pictures for projection on to a screen were prepared.

In an experiment conducted in a London factory 90 per cent. of the people responded to a request for volunteers and of these only three cases in every thousand were found to call for further examination.

Fatality at Power Station

While engaged with other men in oiling and greasing a coal conveyor at the Darlington Corporation electricity works, John William Young, aged 55, was caught in the conveyor and fatally injured. At the inquest it was stated that he was working in the basement and the other men at the top of the machine which stopped, and when the men at the top went to investigate the cause they found Young lying on one of the buckets. Mr. F. King, of the National Union of General and Municipa Workers, criticised the custom of signalling by shouting between men on the ground and on the top of the conveyor and suggested the installation of a telephone or bell system. Mr. T. Huskinson, shift charge engineer, replied that signalling was not a routine job but happened only when the conveyor stopped. Recording a verdict of "Accidental death," the coroner said that although there might be possibilities of improving the system he could not think that there had been any neglect. The Corporation exercised the greatest care on all occasions for the safety of its men.

Industrial Fuel Economy.

Bedford Appeal Judgment

Last year Bedford Corporation successfully appealed at the Borough Quarter Sessions against fines imposed at the Borough Police Court on two summonses arising out of an accident at the electricity works, when Mr. Allan Wilson, assistant station superintendent, received a fatal electric shock (*Electrical Review*, April 24th, 1942). At a recent meeting of the Town Council it was reported that the Factory Inspector had carried the matter to the King's Bench Division where legal arguments by both sides were heard by Mr. Justice Charles and Mr. Justice Stable, who dismissed the Factory Inspector's appeal with costs. Mr. Justice Charles expressed the view that the Corporation was quit of all blame, and Mr. Justice Stable considered that the prosecution had never established a breach of the regulations at all.

Lamp Sales at Luton

Luton Chamber of Trade recently protested to the Luton Town Council against the selling of electric lamps at the Council's electricity showrooms, and submitted that this form of municipal trading should be discontinued.

Referring to the protest, the Electricity Committee reported to the Council that on March 23rd, 1936, following a meeting with a deputation appointed by the electrical retailers, contractors and other representatives in and around Luton, it was agreed that the Council should reserve the right to sell electric lamps at the showrooms to customers who asked for them, but that no steps would be taken to "push" the sale. These arrangements, the Committee stated, had been strictly observed.

It was agreed that a reply should be sent to the Chamber stating that the Council had honoured, and would continue to honour, the arrangement made in 1936.

Fuel Saving

Addressing the Parliamentary Scientific Committee the Minister of Fuel and Power (Major Lloyd George) said that the assistance afforded in the matter of fuel saving by the mild winter of 1942–43 had to be acknowledged. But we could not depend upon a repetition next year and householders would have to show even greater resolution to maintain the standards of economy already achieved. If this were done he hoped that it would not be necessary to reduce domestic fuel consumption below the present level.

Industrialists, too, could economise still

further although their task had been made difficult by the scarcity of new fuel-burning equipment and replacement parts as well as by the fact that they had to accept fuel of a type to which they had not been accustomed. With the help of the Fuel Efficiency Committee a great deal had been achieved. The Committee had met the trade associations of over ninety industries and with them had studied each industry's special problems. Technical bulletins had been prepared and widely distributed, and short practical courses and demonstrations on fuel technology had been started throughout the country.

To bring a knowledge of fuel economy even more directly to the factory the Ministry had recruited a staff of engineers to visit each works in turn and they were supplemented by the part-time voluntary assistance of experts engaged in industry.

Business Reply-paid Postcards

Referring to the leaderette on this subject in our last issue, Mr. V. W. Dale, Assistant Director and Secretary of E.D.A., informs us that the Association has made representations to the Postmaster-General. It is pointed out that the system has proved of considerable benefit to public utilities who have encountered meter-reading difficulties and its retention is advocated.

E.A.W. Conference

The eighteenth annual conference of the Electrical Association for Women is to be held on May 27th at the Institution of Electrical Engineers, London. The annual general meeting is to be followed by an address by Viscount Samuel on " An Electrified Future."

Death Through Climbing Pylon

An inquest was held at Southampton last week into the death of an eight-year-old boy, Brian Harrington, of Totton. It was stated in evidence that the boy climbed a pylon, touched a live line and received a fatal shock. A police witness said that he received a call to the scene and before going communicated with the Central Electricity Board. He found the boy lying across an arm of the pylon. His clothes had been practically burned off and his body appeared to be badly burned. There was a " danger " notice on the pylon.

A medical doctor said that the boy's body had been badly burned. Death was due to syncope from electric shock. The Coroner recorded a verdict of " Death from misadventure."

Crack Detection

Among the several means of detecting cracks in metals, which aid visual inspection, is the " Hyglo " process recently demonstrated by High Grade Metal Tests, Ltd., 24, Marshalsea Road, London, S.E.1. This method is described as applicable to all non-ferrous metals as well as plastic substances and chromic materials.

Small and large objects to be examined are dipped into a heated tank (with provision for automatic temperature control) containing a solution that causes fissures to become visible by reason of fluorescence at their edges when subsequently viewed under ultra-violet light. The liquid employed performs a dual function, for it also contains a substance which, at its boiling point, produces sufficient vapour to quench fluorescence on sound surfaces so that only porous flaws are revealed as vivid green lines, or spots, against a dark background that would otherwise have to be rendered non-luminous by washing, or chalk-dusting. The process can thus be completed in one operation with safety and considerable success by unskilled labour.

The immersion liquid is understood to be self-regenerating, without tending to become saturated or easily contaminated, consequently minimising loss replacement.

On a production run of 1,600 articles, each of a superficial area of 2·1 sq. ft., the operating cost, including energy, drag-out losses and labour at standard rates, is stated to have been 0·08d. per sq. ft. examined. A development of the method is the use of a fluorescent magnetic material instead of the usual " ink " employed with magnetic detectors, bright yellow lines enabling cracks to be easily seen against a black background.

Nuclear Physics Research

Research in nuclear physics, employing deuterons of very high energy generated by the cyclotron, has recently been aided by the use of capillary ion sources capable of producing a greatly increased current of high energy particles. It was found, however, that the intense ion bombardment to which the capillary was subjected soon melted the copper used in its construction, so that the arc tip had to be replaced at frequent intervals. B. R. Curtis and R. S. Bender, of the Harvard University Physics Research Laboratory, now report in the *Review of Scientific Instruments* that, at the suggestion of Dr. Edwin McMillan, of the University of California, they tried constructing the arc capillary of a copper-tungsten " Elkonite." Previously it was necessary to replace the copper capillary after approximately two and a half months; with " Elkonite " the present arc tip has been in operation for nine months and, although showing signs of wear, it is furnishing 50 to 130 microampere beams of deuterons of 11 million volts energy to the target.

Change of Address

Last week we announced that Drake & Gorham, Ltd., were moving their Bristol offices to 2 & 4, Church Street, Temple, Bristol, 1. Actually it is Drake & Gorham Wholesale, Ltd., who are concerned.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

MARVIL super dryer.
HALL-SCOTT engines.

American News

Cable Companies Fined

THE nine American cable manufacturing concerns charged with conspiracy to fix prices of cables supplied to the United States Navy were recently fined a total of $77,500 by a Federal judge in Newark, N.J. The Okonite Products Co., the Rockbestos Products Corporation, the Collyer Insulated Wire Co., the General Cable Corporation, the National Electric Products Corporation and the Anaconda Wire & Cable Co. were each fined $10,000; the General Electric Co. was fined $7,500; and the American Steel & Wire Co. and the Dodge Copper Products Corporation $5,000 each.

According to the *Electrical World*, counsel for the prosecution said that their investigations did not disclose any dishonesty or deception. The General Electric Co., in pursuance of its policy not to make unreasonable profits out of the war, had made voluntary price reductions in Government contracts. The president of the Okonite Co. put in a statement denying that it was guilty of defrauding the Government, but it refrained from entering a defence as a protracted trial would rob the company of the services of four essential men for some weeks.

Manufacturers' Refund to Government

The *Electrical World* reports that the Westinghouse Electric and Manufacturing Co. has accepted a determination of the Navy Price Adjustment Board by which the company will pay back to United States Government agencies $53 million in respect of 1942 contract deliveries. This is in addition to several millions of dollars in voluntary price reductions made on 1942 business. Officials of the company state that modest profit margins were provided for in the estimates but efficiency of production led to substantially higher profits.

The company's net income from the year at $17,366,851 was 25 per cent. lower than the 1941 figure and was equivalent to $5·42 per share of capital stock outstanding. The value of orders received was $1,079·6 million against only $582·8 million in 1941.

Power Resources

Mr. J. A. Krug, Director of the Office of War Utilities of the United States War Production Board, and formerly manager of power for the Tennessee Valley Authority, stated recently that there would be no power shortage in the United States for war and essential civilian requirements.

The aggregate peak load in "Class 1" utility systems in 1942 was about 33 million kW and to serve this there was a dependable capacity of 41·2 million kW. A maximum load of not more than 38 million kW was anticipated this year and to serve this there would be 45·1 million kW of dependable capacity by the end of the year. There might be some tightness in the autumn because a larger amount of new capacity was scheduled for installation in the late months of 1943.

Post-War Trade

Full realisation of the impossibility of solving post-war problems by any country by itself was urged by the United States Assistant Secretary of State, Mr. Dean Acheson, in New York last week. According to a *Reuter* report, Mr. Acheson said that at the end of the war vast areas would be in need of goods of all kinds, but particularly of industrial and agricultural productive equipment and for some time they would need to buy more than they could sell.

On the other hand, the United States and some other countries would have vast unimpaired productive plant and millions of workers released from war production all looking for markets at home and overseas. In other words the United States would need to be a capital exporting nation but they could neither get a return on that capital nor permit those who used it to support themselves by selling a part of their products unless they joined actively in the restoration of international trade.

General Electric Report

Orders valued at $2,003 million were received by the American General Electric Co. in 1942, as compared with $1,132·8 million in the preceding year. The net income available for dividends, however, declined from $57,197,000 to $45,082,000, or from $1·98 per share of common stock to $1·56 per share.

Electronic Line Tracker

CHARTS used for recording the flow of electricity, steam, water, etc., have to be moved from the ink-pen meter for summation of instantaneous values by integration, generally by guiding the stylus of a planimeter over the contour of the graph. This slow operation can be obviated by a more accurate electronic curve tracer described in *Electronics* as employing a beam of light directed by a lens and mirror system to a focal spot approximately 0·005 in. in diameter on the under surface of a translucent chart through which the light is diffused with the aid of additional screens.

A scanning arm above carries a photo-electric cell in association with a pre-amplifier and an output amplifier wherein the "signal" is rectified before passing to a coil mounted on a vertical shaft to which is attached one of the mirrors that reflect the beam of light. The relationship between the polarity of the field produced by the current in this coil (rotor of electromagnetic element) and the external field in which the coil is immersed causes the mirror-coil shaft to urge the light spot towards the centre of the chart.

A coiled spring at the lower end of the rotor shaft exerts bias tension in the opposite direction, so that obscuration of the light spot by intrusion of a graph causes the photocell amplifier to reduce its output of current to the rotor coil; spring tension thus becomes the dominant force, urging the light spot towards the peripheral edge of the intruding opacity throughout the movement, 0·005 in. traverse sufficing to reveal the spot entirely or totally obscure it. The degree of intrusion can be made large or small by modifying the circuit constants.

In this way a graph penned upon a rotating paper chart can be "tracked" in a few seconds, any tendency of the light spot to oscillate being checked with the aid of a third amplifier associated with additional pick-up and output coils attached to the rotor shaft of the three-element electromagnetic system.

Workmen's Compensation

Employee's Application for Review

A VERY interesting case, namely, Leivers *v.* Barber, Walker & Co., Ltd., which recently occupied the attention of the Courts will have a far-reaching effect upon claims under the Workmen's Compensation Act. The term "workman" under the Act includes both manual and non-manual workers whose income is less than seven pounds per week.

Briefly, the facts of the case were these: In 1913, when the employee was seventeen and a half years old, he was severely injured by an accident in the course of his duties and at that time he was within the Workmen's Compensation Act, 1906. His employers paid him compensation until 1921, although there was no award or recorded agreement; that is to say that such payment was not recorded in the county court of the district in which the accident happened. The payment was in respect of partial incapacity from 1921 to October, 1940; from November 6th, 1940, to August 13th, 1941, he received no compensation. Compensation at the rate of twenty-eight shillings per week was paid in respect of his total incapacity from October 8th, 1940, to November 6th, 1940, and he again received payment from August 13th 1941, onwards.

By F. E. Sugden,
A.C.I.S., Barrister-at-Law

Court of Appeal Ruling

The employee was not satisfied with this payment. He therefore made an application for review under the Workmen's Compensation Act, 1906, and asked for an increase in respect of his incapacity from 1921 onwards. He claimed that in assessing the rate of compensation regard should be had to the wages he would have earned if he had remained uninjured. The employers contested this claim and contended that the proceedings for review were an action within the Limitation Act, 1939, and that the claim was therefore barred. (Under this Act, if a person has a simple contract, and he does not take any steps for at least six years, he is "statute barred" and thus cannot enforce his claim.) The Court of Appeal held, however, Lord Justice Goddard dissenting, that the Limitation Act, 1939, did not apply to the present case. This decision was largely based on the fact that the Workmen's Compensation Acts have always been liberally construed; they were deliberately drafted to avoid any undue hardship of this nature.

Incidentally there are some limitations contained in the Workmen's Compensation Act itself; for instance, if a person claims compensation his accident must be reported within a specific time and the claim against the employers must be made within six months of the accident.

The significance of this case is, first, that the payment appeared to be on a voluntary basis at the commencement and was not recorded by the Court, yet in spite of this the Court of Appeal agreed that the case could be re-opened after this lengthy period. The second point is that any accident which may have occurred so far back, and which can be traced to a specific cause, may be re-opened within reasonable limits if it can be shown that the employer had full knowledge of the accident at the time.

My advice to employers is that immediately an accident is reported to them by one of their employees they should make a settlement or come to some specific terms in order to avoid continuing liabilities. This is usually done by payment of a lump sum of money to the employee. However adequate that sum of money might appear to be at the time, the employer or employee should request that the accident be recorded in the county court of the district by applying for what is termed a declaration of liability.

This term is used to indicate that the applicant has made an application to have it recorded; he is not applying for any money but is simply asking that judicial notice should be taken by the county court of the district that such an accident did take place. If the results of his accident increase in gravity the fact that it has duly been recorded gives him the chance to have the case reviewed, even though it is a long time afterwards.

The Limitation Act

The judges came to their decision because Section 32 of the Limitation Act, 1939, lays down that the Act shall not apply to any action or arbitration for which a period of limitation is prescribed by any other enactment. Lord Justice Du Parcq further stated that if one finds in an Act a period of limitation for taking proceedings, which there is in the case of the Workmen's Compensation Act, that in itself decides the point, and he further stated that the Workmen's Compensation Act as amended by the 1925 Act has a self-contained code and is self-explanatory, and it was never the intention of Parliament that the Limitation Act, 1939, should apply to proceedings under it.

One must remember that an "infant" settlement, particularly where a lump sum is

offered by the employer, must be sanctioned by the official arbitrator, who is usually the county court judge of the district in which the accident occurred. That is why all these proceedings are taken in the local county court. I have known cases from professional experience where the employer has offered a settlement and the employee has accepted it but the county court judge has not sanctioned it because, in his opinion, the settlement was not adequate for the injuries suffered by the applicant.

ELECTRICITY SUPPLY

Co-ordination at Burnley. *Manitoba Rural Project.*

Burnley.—CONTROL OF UNDERTAKINGS.—The Town Council last week decided to set up a special committee to report on co-ordinating the control and administration of the gas and electricity undertakings by the appointment of a Power and Light Committee. The investigating committee will comprise three independent councillors, the chairmen and vice-chairmen of the Gas and Electricity Committees and a member of the Labour Party from each Committee.

Clacton-on-Sea. — JOINT METER READING. — Following a unanimous recommendation made at a joint meeting of the Gas and Electricity Committees the Urban District Council, at its April meeting, arranged for an experiment in the joint reading of all meters other than prepayment in the June quarter.

Kettering.—STREET LIGHTING.—The Ministry of Home Security is to be informed by the Council that because of existing time-switch control arrangements it is considered that modified street lighting should not be further curtailed during the period of double summer time.

London.—SOUTHWARK.—The Electricity Committee is to provide an AC supply to Alford & Alder (Engineers), Ltd.

Middlesex.—COUNCIL AND J.E.A.'s REPORT.—The Parliamentary Committee of the County Council, submitting details of the plan put forward by the London and Home Counties J.E.A., states that it will report further on the matter in the event of legislation being introduced to implement the proposed scheme.

Portland.—INSTALLATION REPAIRS.—At a meeting of the U.D.C. Electricity Committee it was reported that various requests were being received for minor repairs to consumers' installations. The net cost of such work was usually very small and the fixed 15 per cent. for on-costs did not cover these charges. The Committee decided to increase the on-cost charge of such work to 25 per cent. up to £3.

Surrey.—REFRIGERATORS.—The County Education Committee is to have refrigerators installed in some of the canteen kitchens in the county.

Overseas

Canada.—MANITOBA RURAL SUPPLY.—Last year the Manitoba Provincial Government set up a commission under the chairmanship of Prof. E. F. Schmidt (Minnesota University) to investigate present and post-war developments. In its report the Commission has recommended a post-war farm electrification programme which would ultimately serve every rural home in the province. The estimated cost of 25,000 farm services in the first ten years (based on 1939 prices) is nearly $17 million. The report proposes that immediate preparations shall be made so that plans may be proceeded with as soon as the war ends.

Spain. — POWER STATION SCHEME. — The Madrid journal, *Metalurgia y Electricidad* reports that the Compania Electrica de Langreo has been authorised to proceed with the establishment of a new thermal power station at Langreo in the Province of Asturias. It will house three 30,000-kW generating sets.

TRANSPORT

Holland.—ELECTRIC TRAIN.—The Dutch State Railways have announced the construction of a new electric train with a maximum speed of 140 km. per hour. All carriages are stated to be equipped with loudspeakers which are operated by the guard. The train is 111 metres long and can carry 55 first- and second-class and 268 third-class passengers, with standing room for 130.

Sweden.—NEW ELECTRIC LOCOMOTIVES.—One of three experimental electric F-locomotives recently made a trial journey from Stockholm Central Station to Malmö, in South Sweden, and back. It hauled an empty train consisting of fifteen bogies and the total weight was 644 tons. A speed of 120 km per hr. was attained in spite of a reduction to 105-110 km per hr. on gradients, and the train was the heaviest yet driven at this rate on any Swedish railway. The "F" type locomotive is constructed for a maximum speed of 135 km. per hr. The three F-locomotives so far built are purely experimental, and the experience gained in the tests made with them will be used as a basis for the construction of the final F-locomotive, of which an order for nine, perhaps twelve, is likely to be given. The locomotive is 15·2 metres long, weighs 102 tons and is of 3,500 HP. —*Reuter's Trade Service.*

RADIO & TELEPHONY

Great Britain.—RADIO RELAY STATISTICS.—Statistics now available indicate that the steady increase in the number of subscribers to radio relay exchanges in this country is being maintained. At December 31st, 1942, there were 435,073 subscribers to 277 exchanges, compared with 414,843 subscribers to 278 exchanges at September 30th. This increase of 20,230 subscribers compares with an increase of 15,858 subscribers during the previous three months, and an increase of 11,751 subscribers during the three months preceding that.

Pulverised Fuel

A Review of American Experience

By Vernon Walker, A.M.I.E.E.

THAT finer pulverisation of fuel reduces the loss due to carbon in the ash hopper refuse, improving the distribution and mixing of the air supply with the fuel, is the experience of thirty supply companies in the United States, according to a recent report by the Boiler and Combustion Sub-Committee of the Edison Electric Institute. Flame length is generally shorter, less trouble is encountered with smoke and a finer ash is discharged from the chimney. Increased fineness has sometimes assisted in reducing slagging of the furnace walls, the lower bank of generating tubes and superheater elements.

Results from Coarse Coal

In some instances coarser coal increases the carbon in the refuse but not noticeably in the fly ash ; in others, however, there is a corresponding increase in the carbon content of both. Experience shows that the control of carbon loss is dependent on the proportion of relatively coarse particles over 50 mesh, the best results being obtained when this does not exceed 1 to 1·5 per cent. Decreased carbon loss has also been obtained by burner adjustments to maintain proper turbulence and utilise the furnace volume to the best advantage.

In one station burning pulverised anthracite, coal fineness inappreciably influences the amount of carbon in the ash hopper. No fusion of the ash with the anthracite occurs, nor is there slagging of the furnace walls or superheater, irrespective of coal fineness. A slight reduction in the carbon content in the stack dust accompanies increase in fineness, which is varied from 70 to 85 per cent. through a 200 mesh. Boiler efficiency appears to be one to two per cent. higher with the fine coal.

From the data submitted, no definite classification can be made of the ash fusion temperatures most suitable for furnaces of the wet- or dry-bottom type, the experience of many of the operators being limited to one type of furnace. One company can burn coal having an ash fusion temperature up to 2,750 deg. F. without difficulty with a wet-bottom furnace; above this temperature slag becomes solidified at the slag spout and interferes with tapping operations. Another company employing dry-bottom furnaces cannot burn coal having an ash-fusion temperature below 2,800 deg. F. if the boiler rating is above 80 per cent.

Some undertakings having boilers with dry-bottom furnaces are able to utilise coals with ash fusion temperatures of from 2,200 to 2,300 deg. F., while others burn the same coal in both types of furnace. The type of furnace wall and, to a limited extent, the rating at which the boiler operates influence the limits of tolerable ash-fusion temperatures.

The characteristics and nature of the coal ash remain the common denominator of the difficulties encountered with the slagging of furnace walls and superheaters in pulverised fuel furnaces. Other coal factors—fineness, volatile content, sulphur—affect slagging in individual cases, and their effects may be divergent in different plants. Ash generally causes trouble in proportion to its quantity, mainly because high-ash coals usually contain a larger sulphur content. Furnace slagging is tolerable if the temperature between initial and fusion temperature is not too great. Where this exceeds 400 deg. F. considerable trouble has resulted from slagging of the superheater elements.

Furnace pulsations are caused by unstable ignition, due to improper mixing of fuel and air. To prevent them uniform coal and air supply is required, with proper burner adjustments and steady damper control. Extremely high draught at the top of the furnace can cause pulsations due to the adverse effect on ignition with some designs. Extremely high or low excess air may also cause pulsations.

Tube-to-Tube Construction

In some furnaces tube-to-tube construction has replaced tubes with extended surfaces such as fin tubes, blocks, and studded tubes. Gas temperature on entering the superheater has been reduced in this way, though the effect on the gas exit temperature may be negligible.

A change to this type of construction in one station has lowered the exit temperature by 50 deg. F. and the gas temperature on entering the superheater by 150 to 200 deg. F. It has also reduced slagging of the superheater and of the furnace walls and burning of fins and studs.

Increased spacing has reduced slagging of superheater tubes and consequently the need for soot blowing. In one case the front section only has been widened by removing every other tube.

When the cause of excessive steam temperature on leaving the superheater is boiler slag accumulations, control of temperature can be maintained only by persistent lancing, blowing of tube surfaces and by manipulation of the by-pass dampers. If the

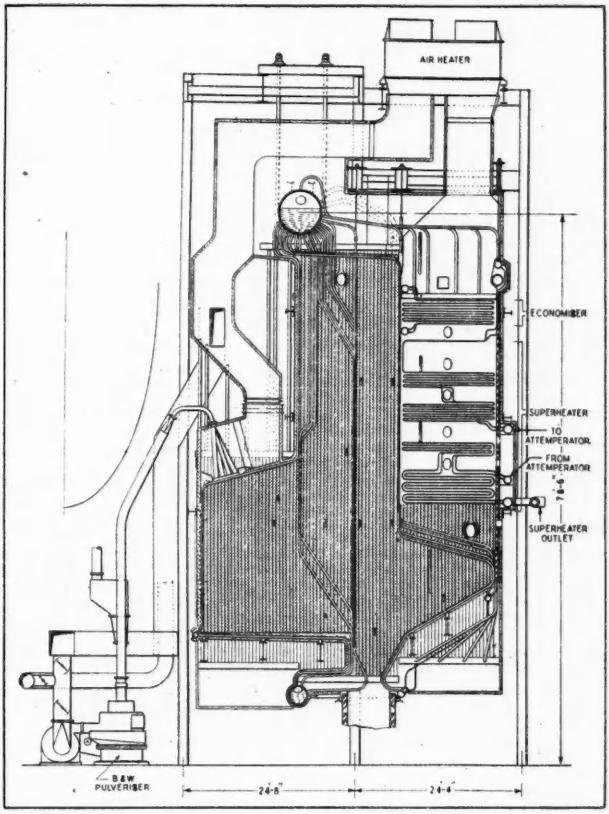
superheater heating surface is on the high side, the corrective effect of by-pass dampers is limited. Under normal boiler operating conditions, by-pass dampers are effective in a control range between 20 and 70 deg. F. and result in a loss in boiler efficiency of less than one per cent.

In a number of stations experiments have been made of returning the fine dust from the boiler passes and precipitator hoppers to wet-bottom or slag-tap furnaces with the aid of a ram. In one case the fly ash has been fed by the dust ram into the primary furnace of a B. & W. radiant-heat boiler through the front wall just above the floor line. In this position the ram feeds the ash into the furnace faster than it will fuse and run off. It accumulates until the pile offers too much resistance to the ram, when the dust leaks past it into the boiler room. The ram sometimes breaks the crust which forms on the fly-ash pile, causing dust to be carried through the boiler setting. Enough is deposited on the superheater to cause unstable conditions requiring soot blowing and hand lancing.

At another station the point of discharge into the furnace is located approximately 6 ft. from the slag tap hole, permitting a pile of fly ash to build up with sufficient exposed area to melt 700 lb. per hour, any excess being discharged from the slaghole. Among the troubles experienced with equipment is the short life of mill exhauster fan blades. This has been doubled by increasing the thickness of the blades by 30 per cent.

One of four B. & W. open-pass boilers which are being installed by the Philadelphia Electric Co. is illustrated. Steam conditions are 1,075 lb. per sq. in. and 910 deg. F., with feed-water inlet temperature of 420 deg. F. The maximum rating is 935,000 lb. per hr., with a continuous rating of 850,000 lb. per hr., the heat liberation of the furnace being 25,300 BThU per cubic foot per hour at normal rating.

The boiler is fired by three " multiple inter-tube " burners and the furnace is of the continuous slag tap design. The steam temperature is controlled by an " attemperator " between the primary and secondary superheater. A continuous tube economiser and tubular air heater are also incorporated with the design.



Section through open-pass high-pressure pulverised-fuel fired boiler

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I.E.E. South Midland Centre.—An increase in the membership of the Centre from 2,007 to 2,358 is reported, representing a gain during the session of 351, divided as follows:—Members, 29; Associate Members, 59; Associates, 15; Graduates, 118; and Students, 130.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Johnson & Phillips, Ltd., state that the profit for 1942, after charging £60,755 for maintenance of buildings, etc., was £507,797, as compared with £502,301 for the preceding year. The amount reserved for taxation is £310,000, an increase of £50,000, but the sum now includes provision for tax on dividends, these being shown net after deduction of tax, instead of gross as in former years. After making this provision and meeting debenture interest, depreciation and other charges, the net profit is £111,454, which compares with £105,987 on a similar basis for 1941, after allowing for £60,000 tax on dividends. The special reserve for contingencies again receives £30,000 and £5,000 is transferred to research and development account. The final ordinary dividend is 7½ per cent., making 15 per cent., less tax, for the year (same) and £101,724 is carried forward, against £85,270 brought in after deducting £17,209 bonus to staff and workpeople for 1941.

The British Oxygen Co., Ltd., reports profits for 1942 of £943,465, an increase of £96,927 as compared with the preceding year. Income tax absorbs £536,080 and directors' fees £2,600, and £42,586 is allocated to pensions funds, leaving a net profit of £362,199 (against £308,187). The ordinary dividend for the year is 15 per cent. (against 14 per cent.), and the balance carried forward is £114,804 (against £67,478 brought in).

Pinchin, Johnson & Co., Ltd., report a net profit for 1942 of £453,121, an increase of £142,262 as compared with the previous year. The final dividend is 6 per cent., again making 8½ per cent. for the year. Provision for income tax and E.P.T. requires £270,000, and it is proposed to add £60,000 to reserve for contingencies. The balance carried forward is £169,202 (against £151,772 brought in).

The Ever Ready Co. (Great Britain), Ltd., has announced a final dividend on the ordinary stock of 20 per cent., plus a bonus of 5 per cent., maintaining the distribution for the year at 40 per cent.

Hopkinsons, Ltd., are paying a final ordinary dividend of 12½ per cent., making 17½ per cent. less tax for the year (against 15 per cent.).

Richard Johnson & Nephew, Ltd., are again paying a dividend of 9 per cent. for the past year.

Glenfield & Kennedy, Ltd., from a net profit of £63,149 (against £63,296) are paying a final dividend of 5 per cent. and a bonus of 10 per cent., again making 20 per cent. for the year.

New Companies

High Grade Metal Tests, Ltd.—Private company. Registered April 16th. Capital, £1,000. Objects: To carry on the business of suppliers of fluorescent lighting for detecting flaws in metals and for other commercial or scientific applications; electricians, mechanical engineers, etc. Subscribers: S. W. Wilkins, Chesham House, Broxbourne, Herts and E. W. Ellis, 19, Aldbourne Avenue, Erleigh, Berks. Solicitor: P. Gartin, 9, Cavendish Square, London, W.1.

Beresfords (Kingstanding), Ltd.—Private company. Registered April 16th. Capital, £1,000. Objects: To acquire the business of wireless instrument dealers and repairers carried on by Beresfords Supply Co., Ltd., at Kingstanding, Birmingham. Directors: J. H. A. Beresford and M. A. Beresford, both of Hollyhurst, Birmingham Road, Wylde Green, near Birmingham and W. H. Elson, 21, Kettlehouse Road, Kingstanding, Birmingham. Registered office: 108, Dale End, Birmingham.

A. G. Deverill & Co., Ltd.—Private company. Registered April 16th. Capital, £500. Objects: To carry on the business of buyers and sellers of new and second-hand power, electrical and engineering plant and equipment, contractors for the repair and reconditioning of the same, etc. Directors: P. Barnard, 11, Allerton Court, Staines Avenue, North Cheam, Surrey, C. I. Biellik, 13, Clifford Way, N.W.10 and A. G. Deverill and A. J. Deverill, both of 180, Blair Athol Road, Sheffield. Registered office: 46 and 47, Telegraph Buildings, High Street, Sheffield.

Milltownpass Electric Light and Power Co., Ltd.—Private company. Registered in Dublin April 17th. Capital, £500. Objects: To produce and accumulate electricity and electromotive force, or other similar agency, and to supply the same for production and transmission, etc. Directors: P. A. Fox, J. Begnall, J. O'Rourke and C. Bennett, all of Milltownpass, Co. Westmeath and W. Dardis and D. P. Shaw, addresses not stated.

Castleman Radio, Ltd.—Private company. Registered April 22nd. Capital, £1,500. Objects: To acquire the business of a radio and electrical engineer and retailer carried on by R. L. Harrison, at Rayners Lane, Pinner. Directors: R. L. Harrison, 13, The Retreat, Harrow, Middlesex, and two others. Registered office: 419-421, Rayners Lane, Harrow.

Keep & Roebuck, Ltd.—Private company. Registered April 23rd. Capital, £2,000. Objects: To acquire the business of an electrical engineer and contractor carried on by C. J. Keep, at Campo Lane, Sheffield, as Keep & Roebuck. Directors: C. J. Keep and Mabel Keep, both of 20, Ranmoor Cliffe Road, Sheffield.

Companies' Returns

Statements of Capital

Brown & Co. (Electrical Engineers), Ltd.—Capital, £5,000 in £1 shares. Return dated December 10th. 4,529 shares taken up. £12 paid. £4,517 considered as paid. Mortgages and charges: Nil.

Sun Electrical Co., Ltd.—Capital, £250,000 in 125,000 7½ per cent. preference and 125,000 ordinary shares of £1. Return dated January 13th, 1943. 125,000 preference and 93,311

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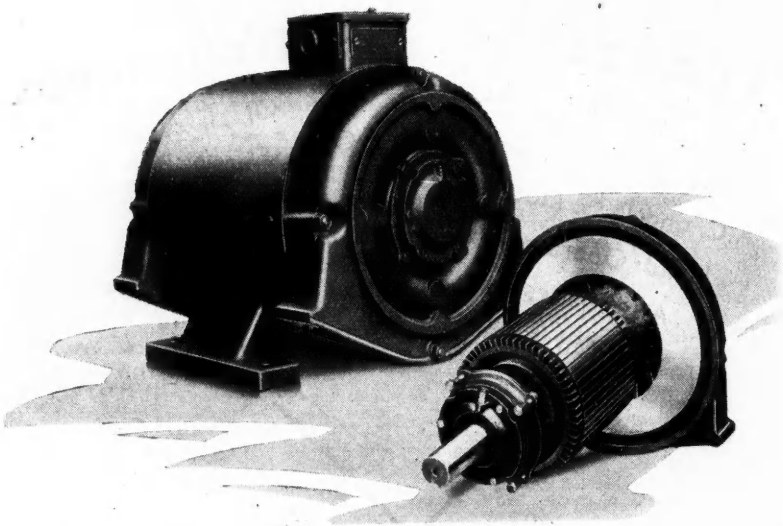

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ordinary shares taken up. £218,311 paid. Mortgages and charges: Nil.

Hanovia, Ltd.—Capital. £25,000 in £1 shares. Return dated January 12th, 1943. 25,000 shares taken up. £20,500 paid. £4,500 considered as paid. Mortgages and charges: Nil.

British Electric Resistance Co., Ltd.—Capital, £50,000 in 2s. shares. Return dated December 14th, 1942 (filed January 9th, 1943). All shares taken up. £10,100 paid on 101,000 shares. £39,900 considered as paid on 399,000 shares. Mortgages and charges: £65,000.

Increase of Capital

Lancashire Dynamo & Crypto, Ltd.—The nominal capital has been increased by the addition of £200,000, in £1 ordinary shares, beyond the registered capital of £460,000. To April 14th, 1942, 400,000 ordinary and 60,000 preference shares of £1 had been issued and fully paid up. The directors at April 2nd, 1943, were H. W. Bosworth, A. E. L. Chorlton, J. H. Dunbar, M. G. R. Elliott, M. V. Ely, R. E. V. Ely, G. E. Mason, F. F. H. Schroeder and J. G. Shaw.

Mortgages and Charges

South Wales Switchgear, Ltd.—Debenture for £5,000 and debenture for £10,000, both dated April 14th, 1943, charged on land and buildings in Pontypridd, and the company's undertaking and other property, present and future, including uncalled capital (ranking *pari passu* with each other). Holders: (a) Barclays Nominees (Lombard Street), Ltd., and (b) Special Areas Reconstruction Assn., Ltd.

Bennie Lifts, Ltd.—Debenture charged on first floor of 2, Tinworth Street, London, S.E.11, and piece of land forming part of 197, Fulham Road, London, with plant and machinery, and the company's undertaking and other property, present and future, including uncalled capital, dated March 30th, 1943, to secure all moneys due or to become due from the company to Westminster Bank, Ltd.

Campbell & Isherwood, Ltd.—Three mortgages on company's properties, all dated April 12th, 1943, to secure all moneys due or to become due from the company to Martins Bank Ltd., not exceeding £3,000, £10,000 and £50,000 respectively.

Wardle Engineering Co., Ltd.—Satisfaction in full on April 10th, 1943, of mortgage dated November 19th, 1920, and registered December 6th, 1920, securing £4,000.

Bankruptcies

R. F. Lovegrove (Wallace Cook & Co.), electrical engineer, 34, Green Lane, Northwood, Middlesex.—Application for discharge to be heard on May 11th, at Bankruptcy Buildings, Carey Street, London, W.C.2.

R. S. Douthwaite, wireless and electrical dealer, 156, Church Street, Whitby.—Last day for receiving proofs for dividend May 15th. Trustee, Mr. J. S. Snowball, Bank Chambers, Scarborough, Official Receiver.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, May 13th, 5.30 p.m. Annual general meeting. 6 p.m. (approx.) Paper: "Standardisation of Motor Dimensions," by Mr. H. Marryat.

Wireless Section.—Tuesday, May 11th, 5.30 p.m. Extra informal meeting when Mr. B. I. Edwards will open a discussion on "Factors Determining the Choice of Carrier Frequency for an Improved Television System."

Transmission Section.—Wednesday, May 12th, 5.30 p.m. Papers on "Protective Systems for Rural Distribution up to 33 kV," by Messrs. D. C. Field, B.A.; O. Howarth; and R. W. Steel and A. W. Allwood, B.Sc. Paper on "Automatic Selective Isolation of Sustained Earth Faults on Networks Protected by Petersen Coils," by Mr. K. I. Brown.

Measurements Section.—Friday, May 21st, 5.30 p.m. Lecture on "Measurement of Small Quantities," by Dr. E. H. Rayner, M.A.

North-Western Centre Wireless Group.—Friday, May 7th, 6 p.m. Engineers' Club, Manchester. Paper: "Time Bases," by Mr. O. S. Puckle.

Western Centre.—Monday, May 10th, 5 p.m. South Wales Institute of Engineers, Cardiff. Paper: "Application of Electricity to Mine Pumping," by Messrs. G. B. Alvey and N. Tetlow.

South Midland Students' Section.—Monday, May 17th, 7 p.m. James Watt Institute, Birmingham. Paper: "Some Applications of Optics to Engineering," by Mr. M. H. Taylor, M.I.Mech.E. (Joint meeting with Graduates' Section, Institution of Mechanical Engineers.)

North Midland Students' Section.—Saturday, May 22nd, 2.30 p.m. Griffin Hotel, Leeds. Luncheon, annual meeting and film afternoon.

Bristol Students' Section.—Saturday, May 29th, 3.30 p.m. Royal Bath Lounge, Bath. Annual meeting. Films will be shown after the meeting.

Illuminating Engineering Society.—Tuesday, May 11th. Institution of Mechanical Engineers, Storey's Gate, London, S.W.1. 4.30—Annual general meeting. 5 p.m.—Address on "Light and Vision," by Sir John H. Parsons, C.B.E.

Iron and Steel Institute.—Thursday, May 13th, 2.45 p.m. 4, Grosvenor Gardens, London, S.W.1. Annual meeting, with presentation of Bessemer Gold Medal and discussion of papers.

Electrodepositors' Technical Society.—Monday May 17th, 5.30 p.m. Northampton Polytechnic, St. John Street, E.C.1. Paper: "Possibilities of Electrodeposition from Non-Aqueous Solutions," by Dr. H. J. T. Ellingham.

Association of Supervising Electrical Engineers.—Tuesday, May 18th, 6.15 p.m. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2. Three winning papers from branch papers competition.

Birmingham Electric Club.—Monday, May 24th. Paper: "Infra-red Lamp Heating Applied to Paint Drying and other Industrial Processes," by Mr. F. E. Rowland, A.M.I.E.E.

STOCKS AND SHARES

TUESDAY EVENING.

ONE of the principal features in the Stock Exchange markets is renewed strength in the junior stocks of the Home Railway companies. By one of those turns of the financial wheel which are difficult to explain, Home Railway stocks suddenly developed a measure of popularity that raised prices by one to three points. The prior charge issues have scarcely changed. Southern Railway preferred, which rose 4 points in the pre-Easter week, gained another 1½ at 79. The 5 per cent. preference is unchanged at 117. London Passenger Transport "C" has held its substantial rise to 63½.

The general tone of markets shows a slight hesitation, due, possibly, to the diversion of funds into the specialised favourites of the moment. Amongst these, Brazilian Tractions stand out with some prominence. Dollar stocks on the whole are a firm market; International Telephone & Telegraph for instance are 3½ up at 14½. The shares are assumed to hold gambling attractions for the American speculator.

Electricity Supply

So quiet since Easter has been the market for Home electricity supply ordinary shares that there is not a quotable change to record in any of the prices given in this week's list. Shares have come in to some extent: it is easier now than it was a month ago to obtain a thousand or two—sometimes five thousand—of the ordinary shares in the leading concerns. Similar conditions apply to the preference shares of these companies. Whereas it was difficult, in early April, to get the offer of any sizeable amount of preference shares, to-day there are available 500 to 5,000 in a number of good concerns. Prices do not come down to any marked extent. The yields are still under 4 per cent. in the majority of cases. South Metropolitan Electric Light and Power 4 per cent. third preference, offered at 22s. 3d., give no more than £3 11s. 9d. per cent. on the money. London Associated Electric 6 per cent. preference can be bought at 29s. to return £4 2s. 9d. per cent.; the others, of category somewhat similar, give an average of approximately £3 17s. 6d. to an investor at to-day's prices. Victoria Falls ordinary have strengthened to 82s. 6d. Palestine Electric "A" are 6d. up at 39s.

Cable & Wireless

Buying of Cable & Wireless ordinary stock continues. To-day's price of 80 compares with 76 at the beginning of the year, when the preference stood at 108. The latter is now quoted at 113½. The ordinary has been as low as 74 this year. The company is expected to declare the usual 4 per cent. dividend, although some people, as already noticed here, profess to look for more. The loss of traffic due to war conditions is thought likely to be compensated for by a substantial reduction in expenses. Four per cent. dividend at 80 affords 5 per cent. return on the money, but to-day's purchasers maintain that even after the recent substantial rise, the ordinary stock cannot be considered overvalued on its post-war prospects.

Nationalisation?

The Anglo-Argentine Tramways group hardened upon the receipt of advices in London to the effect that a note has been sent to the Minister of the Interior by the president of the Buenos Aires City Transport Corporation. The president, who is appointed by the Argentine Government, has made suggestions with the idea of bringing the Corporation under closer control of the State. It seems tolerably obvious that the ultimate intention is to nationalise the whole of the system.

Price Fluctuations

Westinghouse Brake at 66s. 6d., with a transaction marked at 68s., have risen 3s. while Consolidated Signal shares, moving as a rule in correspondence, remain at 5 7/16. Lancashire Dynamo advanced to 90s., the increase in the dividend of 22½ per cent. attracting fresh notice to the shares; at the present price the return comes to a round 5 per cent. on the money. Hopkinsons are better at 58s. 9d.

In the traction market Calcutta Trams show a rise of 3s. 9d. at 28s. 9d. upon buying that is said to originate in India.

The Ultra Electric accounts are on the point of issue and the price of the 5s. shares is a little harder at 7s. 10½d. The figures are thought likely to compare very favourably with those of a year ago, and the declaration of a satisfactory dividend would arouse no surprise.

Home or Foreign?

More than ever, the respective attractions of domestic and foreign securities are the subject of keen discussion. Stocks and shares in Home companies return yields that are modest—candour calls them meagre—but the securities are favoured because of the post-war prospects of the undertakings. Home Railway stocks are the chief exceptions to the low-yield objection; the junior class still offers a good rate of interest on money invested at to-day's advanced figures. With regard to foreign stocks, past experience has provided so many disappointments and losses that a large number of people set their faces resolutely against touching such descriptions, in spite of the scope for capital appreciation

(*Continued on page* 632)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price May 4	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	57/6	..	4 6 10
British Power and Light	6	7	31/–	..	4 10 4
City of London	7	7	30/–	..	4 13 4
Clyde Valley	8	8	39/6	..	4 1 0
County of London	8	8	38/–	..	4 4 3
Edmundson's:					
7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	29/–	..	4 2 9
Elec.Dis.Yorkshire	9	9	44/6	..	4 1 0
Elec. Fin. and Securities	12½	12½	51/–	..	4 18 1
Elec. Supply Corporation	10	10	46/6	..	4 6 0
Isle of Thanet	2	Nil	16/–	..	—
Lancs. Light and Power	7½	7½	35/–	..	4 5 9
Llanelly Elec.	5½	6	26/–	..	4 12 4
Lond.Assoc.Electric	4	3	21/–	..	2 17 2
London Electric	6	6	26/6	..	4 10 7
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	38/6	..	4 3 2
Midland Counties	8	8	38/6	..	4 3 2
Mid. Elec. Power	9	9	43/–	..	4 3 9
Newcastle Elec.	7	7	31/–	..	4 10 5
North Eastern Elec. Ordinary	7	7	32/–	..	4 7 6
7% Pref.	7	7	35/6	..	3 19 0
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	9¾	..	—
Northmet Power: Ordinary	7	7	37/–	..	3 15 8
6% Pref.	6	6	31/6	..	3 16 2
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	38/6	..	4 3 2
Southern Areas	5	5	23/–	..	4 7 0
South London	7	7	26/–	..	5 7 8
West Devon	5	5	23/6	..	4 5 0
West Glos.	4½	3½	23/–	..	3 0 10
Yorkshire Elec.	8	8	40/–	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/9	..	—
Calcutta Elec.	7*	7*	34/6	..	—
Cawnpore Elec.	10	10	30/–	..	6 13 4
East African Power	7	7	32/–	..	4 7 6
Jerusalem Elec.	7	5	25/6	..	3 18 5
Kalgoorlie (10/–)	7½	5	9/–	..	5 11 1
Madras Elec.	6*	4*	24/–	..	—
Montreal Power	1½	1½	27½	..	5 7 2
PalestineElec."A"	Nil	4*	39/–	+6d.	2 1 0
Perak Hydro-elec.	6	7	9/–	..	—
Shawinigan Power	83cts.	90cts.	19	..	—
Tokyo Elec. 6%	6	6	19	..	—
VictoriaFallsPower	15	15	4½	+1/4	3 13 0
WhitehallInv.Pref.	—	—	24/–	..	5 0 0

Company	Dividend Previous	Dividend Last	Middle Price May 4	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955–60 (Civil Defence)	—	3	100	..	3 0 0
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	109	..	4 2 7
1963–93	3½	3½	104½	..	3 7 0
1974–94	3¼	3¼	101	..	3 3 9
LondonElec.Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	111	..	4 1 1
Lond.Pass.Trans.:					
A	4½	4½	122½	..	3 13 6
B	5	5	120½	..	4 3 0
C	2⅞	3	63½	..	4 14 7
WestMidlandsJ.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	113½	..	5 5 9
Def.	1½	1½	28	..	5 7 2
Anglo-Portuguese	8	8	24/–	..	6 13 4
Cable & Wireless:					
5½ Pref.	5½	5½	113½	−1	4 17 1
Ord.	4	4	80	..	5 0 0
CanadianMarconi$1	Nil	4cts.	7/9	..	—
Globe Tel. & Tel.:					
Ord.	8¼*	5*	35/–	..	2 17 2
Pref.	6	6	29/3	..	4 2 3
GreatNorthernTel.: (£10)	Nil	Nil	23	..	—
Inter. Tel. & Tel.	Nil	Nil	14½	+3½	—
Marconi-Marine	7½	7½	33/–	..	4 11 0
Oriental Tel. Ord.	16	10	37/–	..	—
Telephone Props.	6	Nil	14/–	..	—
Tele. Rentals (5/–)	10	10	11/3	..	4 9 0
Traction and Transport					
Anglo-Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	14	+1	—
Brit.Elec.Traction:					
Def. Ord.	45	45	1075	..	4 3 9
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	10	10	51/–	..	3 18 6
Brazil Traction	$½	$1	29	+½	—
Calcutta Trams	8	5½	28/9	+1/16	3 16 6
Cape Elec. Trams	5	6	25/–	..	4 16 0
Lancs. Transport	10	10	43/3	..	4 12 4
Mexican Light:					
1st Bonds	5	5	101½	..	4 18 6
Rio 5% Bonds	5	5	104½	..	4 15 9
Southern Rly.:					
5% Prefd.	5	5	79	+1½	6 6 7
5% Pref.	5	5	117	..	4 5 6
T. Tilling	10	10	53/3	..	3 14 5
West Riding	10	10	43/–	..	4 13 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price May 4	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord...	7½	* 10	40/–	..	5 0 0
Assoc. Elec. :					
Ord.	10	10	50/–	..	4 0 0
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&Tel.	12½	12½	59/6	..	4 6 2
Babcock & Wilcox	11	11	51/6	..	4 5 9
British Aluminium	10	10	50/–	..	4 0 0
British Insul. Ord.	20	20	5 7/16	+⅛	3 13 6
British Thermostat (5/–)	18½	18½	17/6	..	5 5 9
BritishVac.Cleaner (5/–)	10	15	24/3	..	3 1 10
Brush Ord. (5/–)	6	8	8/6	..	4 14 2
Burco (5/–) ..	15	15	14/3	..	5 5 1
Callender's ..	15	15	82/–	+9d.	3 13 0
ChlorideElec.Storage	15	15	79/3	..	3 15 9
Cole, E. K. (5/–)	7	10	20/9	–6d.	2 8 2
Consolidated Signal	17	24	5 7/16	..	4 8 3
Cossor, A. C. (5/–)	15	10*	21/–	..	3 11 5
Crabtree (10/–) ..	17½	17½	37/6	..	4 13 4
Crompton Parkinson Ord. (5/–) ..	20	20	25/–	..	4 0 0
E.M.I. (10/–) ..	6	6	23/9	–3d.	2 10 6
Elec. Construction	10	10	44/–	..	4 11 0
Enfield Cable Ord.	12½	12½	57/–	..	4 7 9
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric	10	10	48/–	..	4 3 4
Ensign Lamps(5/–)	25	25	21/3	..	5 17 8
Ericsson Tel. (5/–)	22†	20†	47/6	..	2 2 2
Ever Ready (5/–)	40	40	38/6	..	5 4 0
Falk Stadelmann	7½	7½	30/6	..	4 18 4
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C. : Pref. ..	6½	6½	34/3	..	3 16 0
,, Ord. ..	17½	17½	89/–	..	3 18 8
Greenwood&Batley	15	15	38/–	..	8 0 0
HallTelephone(10/–)	12½	12½	26/3	..	4 17 0
Henley's (5/–) ..	20	20	25/6	..	3 18 6
4½% Pref. ..	4½	4½	23/–	..	3 18 2
Hopkinsons ..	15	15	58/9	+1/6	5 2 0
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	30	30	6¾	..	4 17 10
Johnson & Phillips	15	15	69/–	..	4 8 3
LancashireDynamo	20	22½	90/–	+ 1/16	5 0 0
Laurence,Scott(5/–)	15	12½	12/–	..	5 4 2
London Elec.Wire	7½	7½	31/6	..	4 15 5
Mather & Platt	10	10	50/–	..	4 0 0
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5¾xd	..	3 14 6
Pye Deferred (5/–)	25	25	22/6	..	5 11 1
Revo (10/–) ..	20	17½	35/–	..	5 0 0
Reyrolle ..	12½	12½	65/9	..	3 16 0
Siemens Ord. ..	7½	7½	30/9	+6d.	4 17 7
Strand Elec. (5/–)	4	7½	6/6	..	5 15 5
Switchgear & Cowans (5/–) ..	10	20	15/–	..	6 13 4
T.C.C. (10/–) ..	5	5	15/–xd	+6d.	3 6 8
T.C. & M. ..	10	10	47/–	..	4 5 1
TelephoneMfg.(5/–)	9	9	12/–	..	3 15 0
Thorn Elec. (5/–)	20	20	20/9	+3d.	4 16 5
Tube Investments	23¾	20	93/6	..	4 5 6
Vactric (5/–) ..	Nil	Nil	13/–	..	—
Vickers (10/–) ..	10	10	20/3	–6d.	4 18 9
WalsallConduits(4/–)	55	55	45/6	+6d.	4 16 9
Ward & Goldstone (5/–)	20	20	22/6	..	4 9 0
WestinghouseBrake	10	12½	66/6	+3/–	3 15 2
West, Allen (5/–)	7½	7½	7/3	..	5 11 2

* 5 per cent. tax-free. † Dividends free of Income Tax.

Stocks and Shares (*Continued from page* 630)

that they are presumed to offer. Mexican utilities, Brazilian Tractions and Argentine transport stocks have risen substantially during the past few months. On the other hand, Home electricity supply shares, to take a representative group, have mostly remained at about the high prices they had already reached. They hold out little prospect of providing either increased dividends or improvement in price. The cable equipment and manufacturing shares are subject to investment pressure. British Insulated are ⅛ up at 5 7/16; Callender's at 82s. are 9d. better, and Siemens put on 6d. at 30s. 9d.

Ever Ready

The Ever Ready Co. (Great Britain), declaring a dividend of 20 per cent. with a bonus of 5 per cent., makes up the rate to 40 per cent. for the whole year, the same as that paid for the previous twelvemonth. The 40 per cent. dividend and bonus have now been paid for four consecutive years. In the two previous years, 1938–1939, the dividends were 35 and 30 per cent. respectively. The company's issued capital is £200,000 in 7 per cent. participating preference stock units of £1, and £1,010,402 in ordinary stock units of 5s. At the present price of 38s. 6d., the highest for years past, the shares give a return of £5 4s. per cent. on the money. In 1940, the price fell to 16s. 3d. The balance sheet is a strong one, goodwill, and trade marks being written off altogether.

Radio

The enthusiasm that ran up the price of A.C. Cossor 5s. shares to 22s. 6d. has given place to quieter conditions in the market. Speculation is awaiting with eagerness an official statement as to what is going on in the direction of agreement with other companies. From such surmises it was no more than natural that vague talk should arise concerning the possibility of a merger to embrace most of the companies in the radio business. Few of the rumours, it is safe to guess, had any foundation in fact, but they succeeded in keeping alive public interest in the market. Pye deferred 5s. shares, it may be useful to observe, hold their last week's gain of 1s. 3d.; at the current price of 22s. 6d. the yield is still a trifle over 5½ per cent. on the money. E.K. Cole shares, 6d. lower on the week at 20s. 9d., yield 2½ per cent. at that price.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKT.-GES. Brown, Boveri & Cie.—"Ultra-high-frequency generators." 7334/41. February 20th, 1940. (552610.)

Akt.-Ges. für Technische Studien.—"Method for regulating the output of thermal power plants and arrangement for carrying out this method." 4903/42. May 8th, 1941. (552665.)

Automatic Telephone & Electric Co., Ltd., and E. Frydman.—"Electromagnetic interrupters." 13264. October 15th, 1941. (552651.)

J. L. Baird.—"Apparatus for producing images by television in stereoscopic relief." Cognate applications 8774/41 and 12862/41. July 11th, 1941. (552582.)

British Thomson-Houston Co., Ltd.—"Mica sheets and methods of making the same." 2137/42. February 18th, 1941. (552545.) "Production of organo-silicon polymeric compounds." 5449/41. April 30th, 1940. (552640.) "Gaseous electric discharge lamps." 4004/42. March 28th, 1941. (552657.)

British Thomson-Houston Co., Ltd., and R. Maxted.—"Signal or sign device for facilitating distance estimating." 1175. January 28th, 1942. (552534.)

Cable Covers, Ltd., and J. Drysdale.—"Protecting tiles for electric cables and the like." 1389. February 2nd, 1942. (552535.)

Chloride Electrical Storage Co., Ltd., and H. C. Jones.—"Electric accumulators." 11798. September 15th, 1941. (552647.)

R. Crittall & Co., Ltd., and B. Adshead.—"Electrical systems for heating fluids in pipes and in containers." 14230. November 5th, 1941. (552591.)

Electrical Research Products, Inc.—"Fluorescent screens and cathode-ray tubes." 7069/41. June 12th, 1940. (552523.)

Electrolux, Ltd. (Aktiebolaget Elektrolux).—"Dishwashing machines." 13693. October 24th, 1941. (552580.)

English Electric Co., Ltd., J. P. Chittenden and R. J. Welsh.—"Power plant incorporating a turbine supplied by gas generators." 14762. November 17th, 1941. (Addition to 551516.) (552595.)

English Electric Co., Ltd., H. S. Carnegie, A. Asbury and E. H. H. Hassler.—"Electric controllers." Cognate applications 8796/41 and 5669/42. July 11th, 1941. (552611.)

Hazeltine Corporation.—"Colour television signal-translating system." 4105/42. April 28th, 1941. (552659.)

S. I. Hitchcock.—"Permanent magnets." 8665. July 9th, 1941. (552558.)

Igranic Electric Co., Ltd., and C. E. Randall.—"Dashpots." 16410. December 19th, 1941. (552603.)

Igranic Electric Co., Ltd., and J. R. Taylor.—"Overload or like switches." 16008. December 11th, 1941. (552602.)

Industriaktiebolaget Luxor.—"Record-changing mechanisms for gramophones." 2220/42. December 6th, 1940. (552546.)

G. Jackson & Sons, Ltd., and C. W. Symonds.—"Electric fires." 92. January 2nd, 1942. (552607.)

Kolster-Brandes, Ltd., D. N. Corfield and A. B. Atkinson.—"Electric terminals or binding-posts." 13079. October 10th, 1941. (552571.)

J. Lucas, Ltd., and G. D. Spencer.—"Filling devices for electric storage batteries." Cognate applications 13276/41 and 1435/42. October 15th, 1941. (552652.)

Marconi's Wireless Telegraph Co., Ltd.—"Frequency-modulation receivers." 4019/42. March 26th, 1941. (552658.) "Cavity resonators." 12713/41. October 1st, 1940. (552670.)

Mather & Platt, Ltd., and S. W. Marsland.—"Chemical fire extinguishers." 2060. February 16th, 1942. (552626.)

Mullard Radio Valve Co., Ltd., and C. E. G. Bailey.—"Electrical condensers." 13110. October 10th, 1941. (552572.)

A. Peet.—"Electric water heating apparatus." 1043. January 24th, 1942. (552535.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Amplifying circuits for ultra-short waves." 10640. August 20th, 1941. (552526.) "Devices comprising electric gaseous discharge tubes." 15246. November 26th, 1941. (552597.) "Cathode-ray tubes." 9651. July 29th, 1941. (552612.) "Neutralised high-frequency amplifiers." 13229. October 14th, 1941. (552650.)

Standard Telephones & Cables, Ltd.—"Cathode-ray tubes." 975/42. November 12th, 1940. (552622.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—"Measurement of the time intervals between two electrical pulses." 3717. March 20th, 1942. (552635.)

A. H. Stevens (Battelle Memorial Institute).—"Methods of electro-polishing metals and aqueous electrolytes suitable for use in such methods." 3910. March 24th, 1942. (552638.)

Westinghouse Electric International Co.—"Electric circuit-interrupters of the fluid-blast type." 363/42. January 25th, 1941. (552608.)

TRADE MARK APPLICATIONS

THE following application has been made for a British trade mark. Objections may be entered within a month of April 28th :—

EDISWAN. No. 621,976, Class 11. Electric discharge lamps for lighting.—The Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2. To be associated with No. 82,168 (573) xiii and others.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Abertillery.—May 17th. Electricity Department. Cables, wiring accessories, service materials, meter boards, meters, lamps for public lighting, wood poles, general maintenance material, cookers and spare parts. (April 30th.)

Birkenhead.—May 17th. Electricity Department. Cables, meters and general stores. (April 30th.)

Skelmersdale.—Urban District Council.—Installation of electricity in Town Hall buildings; E. S. Rosbotham, clerk and surveyor, Town Hall, Skelmersdale, Lancs.

Slough.—May 26th. Town Council. Supply and erection of (1) borehole pump (without motor); and (2) horizontal electrically driven pumping set for a duty of 85,000 gallons per hour against 285 ft. head. Specifications and form of tender from E. Gardner Thorp, waterworks engineer, Town Hall. Tenders to J. H. Warren, town clerk.

Orders Placed

Gateshead.—Corporation. Accepted. Five electric cookers for the General Hospital (£118). J. E. Favell & Co.

London. — STOKE NEWINGTON. — Electricity Committee. Accepted. Repairs to meters and demand indicators.—Reason Manufacturing Co. 100 cooker control units.—M.K. Electric. Repairs to 40 wash boilers.—Universal Boilers & Engineering Co.

Middlesex.—Health Committee. Accepted. Cable and switching for West Middlesex hospital (£173).—Page & Girling.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnard Castle.—Houses for agricultural workers at Ingleton; surveyor, R.D.C. Offices, Barnard Castle.

Billingham-on-Tees.—Garage for ambulances at High Clarence; U.D.C. surveyor.

Birmingham.—Garage, Lidiate Ash; Harry Holmes, Ltd., haulage contractors, Whetty, Rubery, Birmingham.

Chapel-en-le-Frith.—Houses (12) at Chapel, Hayfield and Green Lane for R.D.C.; T. Dinsdale, surveyor, Council Offices, Market Street.

Coatbridge.—Completion of 64 houses for Town Council; burgh surveyor.

Darlington.—Reconstruction of pattern shop, York Street, for T. Summerson & Son.

First-aid post and ambulance room, Whessoe Lane, for Darlington Rolling Mills.

Durham.—Central kitchen at Helmington Row School; county architect, 34, Old Elvet, Durham.

Provision of meals facilities at schools: Broom Cottages and Kimblesworth Council Schools; F. W. Goodyear & Son, builders, Durham. Annfield Plain Boys' Intermediate School; H. F. Mole, builder, Chester-le-Street.

Gosforth.—Nursery (£1,000); surveyor, U.D.C. Offices, Gosforth, Newcastle-on-Tyne.

Lancashire.—Additions to Park View Council School, Huyton-with-Roby; L. Evans, county architect, County Offices, Preston.

Leicestershire.—Dining-hall at Council School, Melton Mowbray (£1,500); E. G. Fowler, county education architect, Greyfriars, Leicester.

Litherland.—Rebuilding classrooms at Lander Road Council School after fire; Henry Boot & Sons, Ltd, building contractors, Church Road, Litherland, Liverpool, 21.

Macclesfield.—X-ray department at Macclesfield Infirmary (£4,000); Dr. J. Blair Hartley, radiologist, 43, Pine Road, Didsbury, Manchester, 20.

Manchester.—Additions, "Ess Bee" clothing factory, Hulme Hall Road; P. Cummings, architect, Appleby Lodge, Wilmslow Road.

Wartime day nursery, Briscoe Lane, Newton Heath; G. Noel Hill, city architect, Albert Square, Manchester, 2.

Musselburgh.—Completion of 39 houses; director of housing, Municipal Offices.

Newcastle-on-Tyne.—Rebuilding 20, Grainger Market; J. F. C. Solomon, architect, Town Hall.

Newton Heath.—Reconstruction of workshop and canteen, Oldham Road and Holt Street; Banister, Walton & Co., Ltd., constructional engineers, Trafford Park, Manchester, 17.

North Riding.—School meals facilities at Staithes, Reeth and Martin-in-Cleveland (£1,300) and central kitchens at Richmond (£2,350) and Thirsk (£1,450); county architect, Northallerton.

Salford.—Office, Bridge Paper Mills; R. A. Brand & Co., Ltd., paper manufacturers, Holland Street, Pendleton.

Southgate. — Workshop, 234-236, Green Lanes; Saul & Slater.

Showroom, 808, Green Lanes; Nigby, Keeling & Co.

Stockport.—Reconstruction of transformer houses at electricity works (£2,030); William Moss & Son, building contractors, Roscoe Street, Liverpool.

Wakefield.—Children's ward and extensions to private patients' wards at Clayton Hospital and Wakefield Dispensary; T. F. W. Macheown, secretary and superintendent, Northgate, Wakefield.

Whaley Bridge.—Works canteen; Goyt Mill Manufacturing Co., Ltd.

Wigan.—Rehabilitation centre for Lancashire and Cheshire Miners' Welfare Joint Committee; joint secretaries, 18, King Street, Wigan.